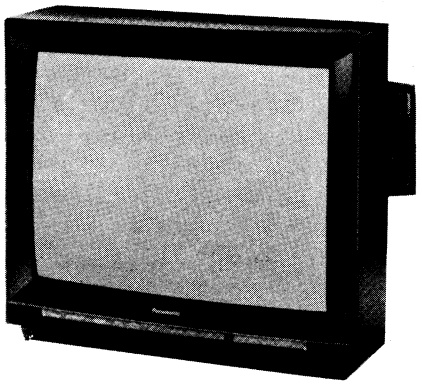
ORDER NO. MIC8803209F1
B5

Service Manual

Color Television

CTK-2780S



CTK-2780S

CHASSIS AEDP150 (GL7S)

Main Manual

The service technician is required to read and follow the "Safety Precautions" and "Important Safety Notice" in this service manual.

Specifications

Power Source:	120 volts, 60Hz, AC
Power Consumption:	2.2 amps max.
Antenna Terminal Impedance:	2-UHF/VHF input-75Ω coaxial type 1-UHF/VHF output-75Ω coaxial type
Channel Capability:	155 Channel (Phase 10 Synthesizer)
Off the Air:	VHF 2~13, UHF 14~69
Cable:	99 channels
Anode Voltage:	30.5kV Max. (Zero beam) 29.5kV (+1.0kV, -1.5kV)
Audio Output Power:	Stereo-2W x 2W 2-way, 4 speaker sound system Two 6" 8Ω & two 2-1/2" 140Ω speakers
Surround Sound:	Enhanced Stereo
Video Input Jack:	1V p-p, 75Ω, phono jack type
Audio Input Jack:	500mV RMS, High impedance-10K
Audio Out/Variable:	0-500mV RMS, 10K
External Speaker Terminals:	Use 8Ω speaker
Surround Speaker Terminals:	Use 8Ω speaker, 85dB min. efficiency
Stereo/SAP Decoder Circuit:	Built In Circuit
S-VHS VCR Input Terminal	
Remote Control:	Unified, Infra-red system
ColorPilot:	One button automatic compensation for Color, Tint, and Contrast
Notch Filter:	Reduce interference caused by chroma mixing with video and being apparent on horizontal lines.
Velocity Modulated Scan:	Electronically slows scanning when transition between dark and light images
Picture Tube:	M68JUA21X 27" diagonal 110 degree deflection
Dimensions:	Height - 23-9/16" (598 mm) Width - 29-3/4" (756 mm) Depth - 19-13/16" (503 mm)
Weight:	88-1/2 lbs. (40.1 kg)

Specifications are subject to change without notice or obligation.
Weight and dimensions shown are approximate.

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IMPORTANT SAFETY NOTICE

There are special components used in this television set which are important for safety. These parts are BOXED on the schematic diagram and shaded on the replacement parts list. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent X-RADIATION, shock, fire or other hazards. Do not modify the original design without the permission of the manufacturer.

SAFETY PRECAUTIONS

GENERAL GUIDELINES

An ISOLATION TRANSFORMER should always be used during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the receiver and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

When servicing observe the original lead dress, especially in the high voltage circuit. In case of a short circuit, replace every part which has overheated.

Always REPLACE PROTECTIVE DEVICES, such as fishpaper, isolation resistors, capacitors and shields after working on the receiver. Use only manufacturer's recommended rating for fuses, circuit breakers, etc.

High potentials are present when this set is operating. Operation of the set without the rear cover involves the danger of a shock hazard from the set's power supply. Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high-voltage equipment.

Extreme care should be used in HANDLING THE PICTURE TUBE. Rough handling may cause it to implode due to atmospheric pressure (14.7 lbs. per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure in removal or installation. When handling, use safety goggles and heavy gloves for protection. Discharge picture tube by shorting the anode connection to chassis ground (not cabinet or other mounting parts). When discharging . . . go from ground to anode with a well insulated piece of wire.

Avoid prolonged exposure at close range to unshielded areas of the picture tube. Possible danger of personal injury from unnecessary exposure to X-ray radiation may result.

The TEST PICTURE TUBE used for servicing the chassis at the bench should incorporate a safety glass and magnetic shield. The safety glass affords shielding from the tube viewing area against X-ray radiation as well as implosion protection. The magnetic shield limits X-ray radiation around the bell of the picture tube in addition to restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling 30.5kV without causing X-radiation.

BEFORE RETURNING A SERVICED RECEIVER (**of any type**) TO THE OWNER, the service technician must thoroughly test the unit to be certain that it is completely safe to operate without danger of electrical shock. DO NOT USE A LINE ISOLATION TRANSFORMER WHEN MAKING THIS TEST.

LEAKAGE CURRENT COLD CHECK

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and each exposed metallic part such as screwheads, antenna terminals, control shafts, etc. If the exposed metallic part has a return path to the chassis, the reading should be between 240kΩ and 5.2MΩ.

When the exposed metal does not have a return path to the chassis, the reading must be infinite.

LEAKAGE CURRENT HOT CHECK (See Figure)

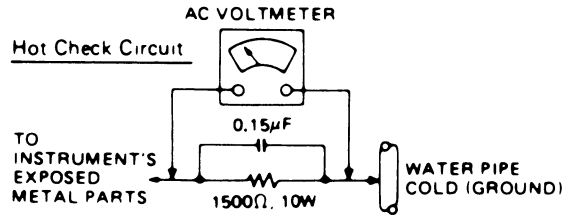
Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during this check.

Connect a 1.5kΩ 10 watt resistor in parallel with a 0.15μF capacitor between each exposed metallic part and ground. Use an earth ground, for example a water pipe.

Using an AC voltmeter with 1000 ohms/volt or more sensitivity, measure the potential across the resistor.

Move the resistor connection to each exposed metallic part and measure the voltage present.

Check that any potential does not exceed 0.75 volt RMS. A leakage current tester (Simpson Model 229, Sencore Model PR57 or equivalent) may be used in the above hot check, in which case any current measured must not exceed 1/2 milliamp. In case any measurement is out of the limits specified, there is a possibility of a shock hazard and the set must be repaired and rechecked before it is returned to the customer.



X-RADIATION

WARNING: The potential source of X-radiation in TV sets is the High Voltage section and the picture tube.

NOTE: It is important to use an accurate, periodically calibrated high voltage meter.

Turn the Brightness, Picture, and Color controls fully counterclockwise.

Measure the High Voltage. The high voltage meter should indicate 29.5kV +1.0kV, -1.5kV. If the upper meter indication is out of tolerance, immediate service and correction is required to ensure safe operation and to prevent the possibility of premature component failure.

HORIZONTAL OSC. DISABLE CIRCUIT TEST

This test must be made as a final check before the set is returned to the customer. See DISABLE CIRCUIT PROCEDURE in this manual.

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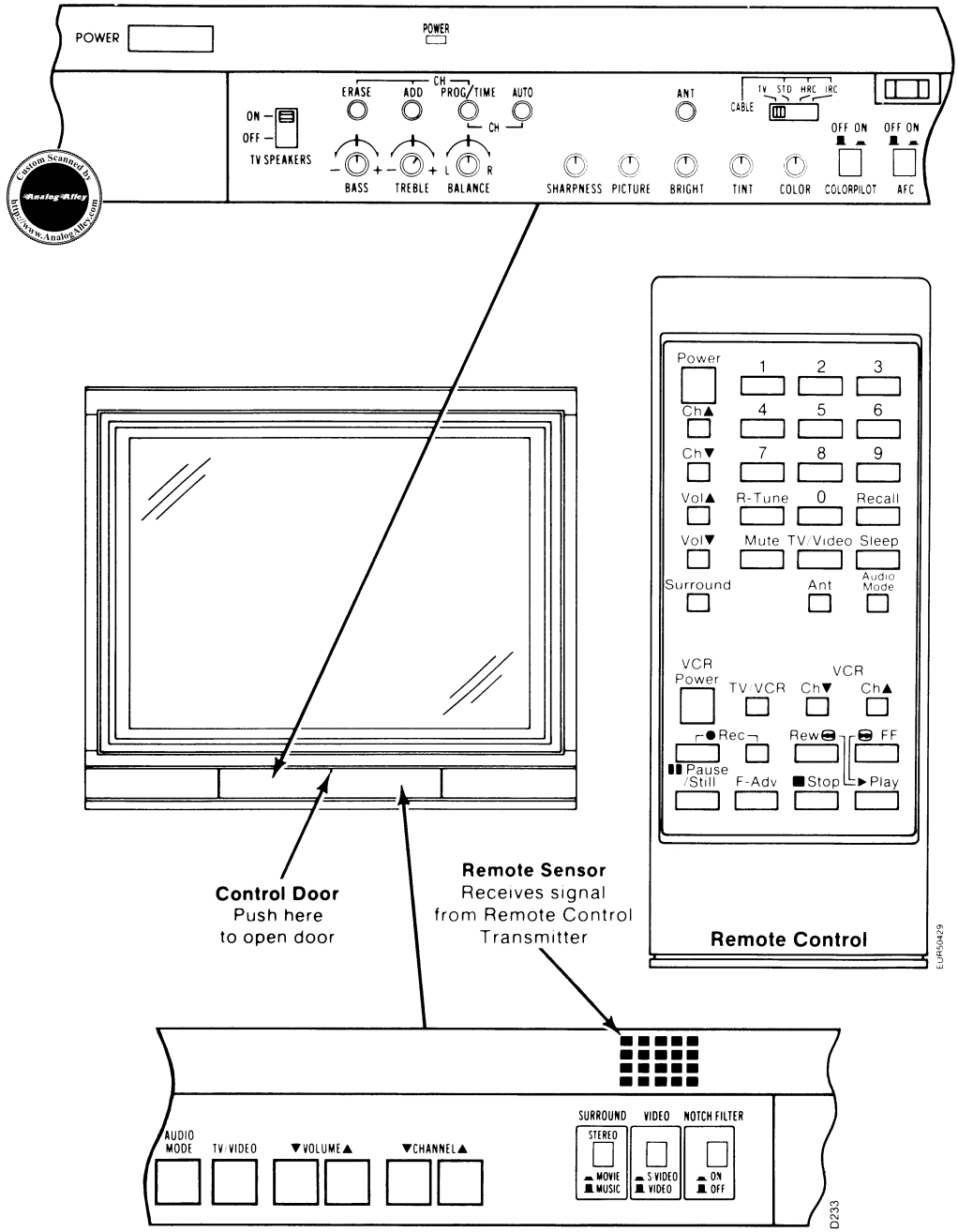
GENERAL INFORMATION

LOCATION OF CONTROLS



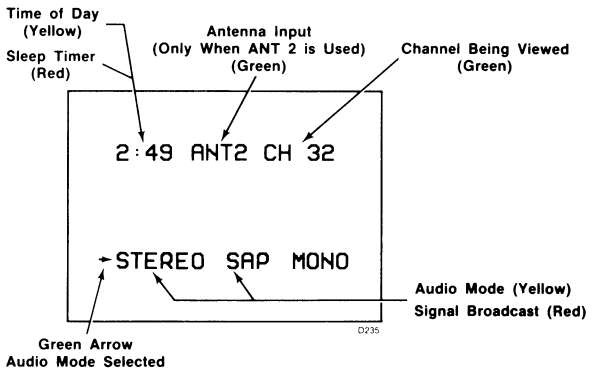
ON SCREEN DISPLAY

POWER ON:

When power button is pressed to turn the set "ON", DISPLAY will be CHannel being viewed in green.

CHANNEL CHANGE:

When the channels change, DISPLAY will be CHannel being viewed, TIME OF DAY (when clock is set) and STEREO-SAP-MONO (if channel is broadcasting a Stereo or SAP signal).



TV CHANNELS

This set is capable of receiving 155 air and nonscrambled cable channels in the U.S.A. (119 air and nonscrambled cable channels in Canada). This includes 12 VHF channels, 56 UHF channels and in the U.S.A., 57 cable channels (51 cable channels in Canada). In the event your cable system provides any or all of the Ultra Band cable channels, you may receive up to a total of 155 channels.

These channels include all of the cable channels designated by Canada for cable compatible TV receivers, plus all of the additional EIA/NCTA channels.

This receiver offers a TV/CABLE switch that allows you to select between regular TV broadcast and three forms of cable TV transmissions. With the switch you can select between the following TV signal systems:

TV-CABLE SWITCH POSITION	SIGNAL SYSTEM
TV	Off The Air TV Signals
STD	Standard Cable TV Signals
HRC	HRC Cable TV Signals (Harmonic Related Carrier)
IRC	IRC Cable TV Signals (Incremental Related Carrier - also called ICC or Incremental Coherent Carrier)

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For each of these systems, appropriate exact frequencies are synthesized within your receiver assuring precise tuning. The tuning system is so precise that no AFC (Automatic Fine Tuning Control) action is required for tuning; however AFC is available by separate switch and can be used if signal frequencies are significantly different from any of the four available systems. Normally leave AFC switch in **OFF** position for precise quartz tuning.

TV/CABLE SWITCH SETTING

TV - If you are not connected to a cable TV system, set the TV/CABLE switch to TV position. You can now receive off-the-air TV signals through your indoor or outdoor antenna.

CABLE - When your TV is connected to a cable TV system and you are not using a cable company converter box, set the TV/CABLE switch to one of the three cable positions as explained above.

If some cable channels do not appear to be properly tuned in the TV/CABLE switch position you selected, try each of the other two cable switch positions with AFC switch in the OFF position.

Your cable company can advise as to which system they are using and the channel number system used in your area.

BAND	USA	CAN.
VHF	12	12
UHF	56	56
CABLE (Mid-Band)	15	11
CABLE (Super Band)	14	14
CABLE (Hyper Band)	28	26
CABLE (Ultra Band)	30	—
TOTAL CHANNELS	**155**	**119**

*Channel Indicator Reading	Air Channels	Formerly Used Cable Channel Numbers	*Channel Indicator Reading	Air Channel	Formerly Used Cable Channel Numbers
01	—	4 + (formerly 5A)	51	51	OO
02	2	2	52	52	PP
03	3	3	53	53	QQ
04	4	4	54	54	RR
05	5	5	55	55	SS
06	6	6	56	56	TT
07	7	7	57	57	UU
08	8	8	58	58	VV
09	9	9	59	59	WW
10	10	10	60	60	XX
11	11	11	61	61	YY
12	12	12	62	62	ZZ
13	13	13	63	63	AAA
14	14	A	64	64	BBB
15	15	B	65	65	65
16	16	C	66	66	66
17	17	D	67	67	67
18	18	E	68	68	68
19	19	F	69	69	69
20	20	G	70	—	70
21	21	H	71	—	71
22	22	I	72	—	72
23	23	J	73	—	73
24	24	K	74	—	74
25	25	L	75	—	75
26	26	M	76	—	76
27	27	N	77	—	77
28	28	O	78	—	78
29	29	P	79	—	79
30	30	Q	80	—	80
31	31	R	81	—	81
32	32	S	82	—	82
33	33	T	83	—	83
34	34	U	84	—	84
35	35	V	85	—	85
36	36	W	86	—	86
37	37	AA	87	—	87
38	38	BB	88	—	88
39	39	CC	89	—	89
40	40	DD	90	—	90
41	41	EE	91	—	91
42	42	FF	92	—	92
43	43	GG	93	—	93
44	44	HH	94	—	94
45	45	II	95	—	A-5
46	46	JJ	96	—	A-4
47	47	KK	97	—	A-3
48	48	LL	98	—	A-2
49	49	MM	99	—	A-1
50	50	NN			

*These are the 99 standard assigned EIA/NCTA cable channel numbers covering STD, HRC and IRC cable systems. These channels include all of the cable channels designated by Canada for cable compatible TV receivers.
IRC is sometimes called ICC. They are the same for the purpose of tuning this receiver.
Some cable companies have not yet adopted the EIA/NCTA cable designations. Therefore there may be some variation between cable systems. If in doubt, consult your cable company or local dealer.

OPERATION

MANUAL OR REMOTE

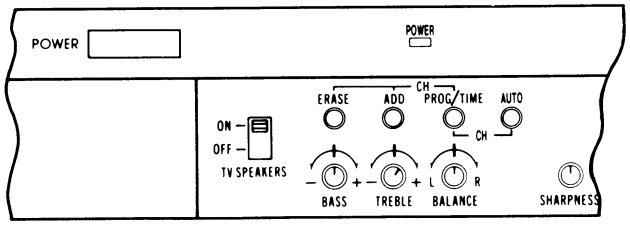
Make sure: TV/CABLE switch is set correctly for the TV signal system used in your area. (See TV CHANNELS section).
TV/VIDEO switch is in TV position.

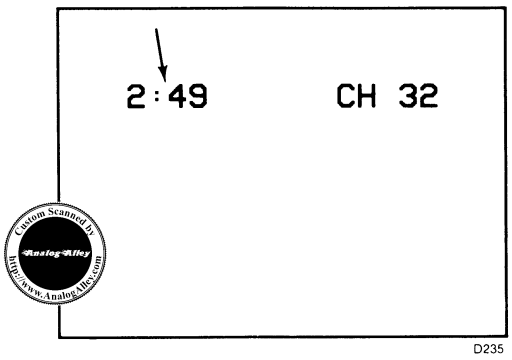
1. Push POWER button to turn the receiver ON. Red Power indicator will light.
2. Press either VOLUME ▲ or VOLUME ▼ button to change the sound level. Hold button in until desired level is reached, then release. Sound level will be displayed on screen by a row of green bars whenever VOLUME buttons are pressed; the row becomes longer as volume increases and shorter as volume decreases to indicate volume setting visually.
3. **Channel Selection - Using CHANNEL ▲ and CHANNEL ▼ Buttons**
   Select the desired channel by pressing either the CHANNEL ▲ or the CHANNEL ▼ button. Hold button in until desired channel is reached. Receiver will tune only to previously programmed channels. See TO PROGRAM CHANNELS section.
   Channel Selection - Using 0-9 Digits on Remote Keyboard
   For Channels 1 through 9 - Enter a single number for a channel change. Example: For channel 8, press the digit 8, for channel 3 press the digit 3. After 2-3 seconds, the channel changes. (For faster entry, enter 0 first).
   For Channels 10 through 99 - Two numbers must be entered to complete a channel change. Example: For channel 25 press the digit 2, then the digit 5. When the first button is pressed, the tens digit will appear. The second entry displays the units digit and the channel changes.
   If the second entry is not made within 2 seconds following the first entry, the channel will change to the number of the first digit entered. Example: For channel 25, the 2 digit is pressed first and if the 5 digit is not pressed within 2-3 seconds, the set changes to channel 2.
   If an invalid channel number is entered (Example: 00 or any number above 69 in the TV position of TV/CABLE switch), the set remains on the existing channel.

NOTE:
When the receiver is turned ON —

1. The last channel viewed will appear and On Screen channel display will remain visible for approximately 18 seconds.
2. All previously programmed functions, except MUTE, will operate.
3. Memory functions (except MUTE) will not be lost if power to the receiver is interrupted by disconnection of wall plug, etc.

TO SET ON SCREEN TIME DISPLAY





1. Press PROG/TIME button. A yellow time display appears.
2. Hold button for 5 seconds. Display turns green and the time advances rapidly.
3. Release button when time approaches the desired time.
4. Time can now advance slowly by one minute intervals by each momentary press of button. (Note: A continuous press of the button will again advance the time rapidly).
5. Stop at the desired time. When display turns yellow, the clock is set. Time will display in yellow with each change of channel.
6 Loss of power to set will turn clock function off. Time displays at 0:00.

TO PROGRAM CHANNELS

This receiver provides a feature called PROGRAMMABLE SCAN. With this feature you can program channel change to stop on every channel where there is a signal or to stop only on those channels you prefer. Both methods eliminate unwanted channels during channel change.

- TV/VIDEO button select TV function.
- TV/CABLE switch in position for correct signal system.

CHANNEL CHANGE — ALL CHANNELS WITH SIGNAL

1. Press PROG/TIME and AUTO buttons at same time to activate. Set will scan through all TV channels. Only channels with signal will remain in memory and display of channel is green.

CHANNEL CHANGE — SELECT PREFERRED CHANNELS

1. Hold down PROG/TIME button while using CHANNEL ▲ (up) or CHANNEL ▼ (down) to scan to the desired channel. OR use remote control to tune the desired channel by direct entry.
   NOTE: Display of channel in yellow indicates channel not in memory. Display of channel in green indicates channel in memory.
2. To ADD a channel to program scan memory, press PROG/TIME and ADD buttons at the same time. Display of channel will be green.
3. To OMIT a channel from program scan memory, press PROG/TIME and ERASE buttons at the same time. Display of channel will be yellow.

There is no limit to the number of channels that can be memorized up to the full channel capacity of any one of the signal systems.The programmed functions are retained even if power is interrupted.

OPERATING FEATURES
ACTIVATE BY TV OR REMOTE CONTROL

AUDIO MODE
Pressing of AUDIO MODE button on Remote Control or Receiver Front Panel will show on screen display of STEREO, SAP, MONO. While display is on, each press of the AUDIO MODE button will move an arrow that points to one of these three modes. When STEREO or SAP display is yellow it indicates channel being viewed is not broadcasting STEREO or SAP signal.

- STEREO: If the channel selected broadcasts a stereo TV program, the STEREO display will be in red. Point arrow to STEREO display using AUDIO MODE button to receive stereo broadcast.
- SAP: (Second Audio Program) If the channel selected broadcasts a second audio program, for example, a bilingual program; the SAP display will be in red. Point arrow to SAP display using AUDIO MODE button to receive SAP broadcast.

  If red display of STEREO or SAP blinks to yellow, it is an indication of insufficient signal from the antenna. Assuming antenna connections are good, a better antenna may help. If not, point arrow to MONO using AUDIO MODE button. This selects standard TV sound.

AUDIO MODE DISPLAY ERASE
Every time a channel broadcasting STEREO or SAP is selected, STEREO, SAP, MONO will display on screen. If no display is desired, simply press ERASE button, a series of red dashes will appear on screen. This indicates display has been erased. Press ADD button to have display return.

TV/VIDEO BUTTON
Each press of TV/VIDEO button on Remote or Receiver Panel, alternately switches between TV and VIDEO mode.

- TV (CH and channel number display on screen) normal TV operation.
- VIDEO (Video will display on screen) used when optional accessory video equipment (such as VCR, video disc player etc.) is connected to INPUT terminals on back of set. See TO CONNECT OPTIONAL EQUIPMENT section.

VIDEO/AUDIO INPUT JACKS
(FOR ACCESSORIES)

These direct VIDEO/AUDIO input jacks (located on the TV back) let you hook up your VCR, Video Disc Player or Home Computer for viewing on the TV screen. You receive the best possible picture from your video sources by using these direct input jacks.

The TV/VIDEO mode switch at the Receiver or the Remote Control selects regular TV operation or accessories connected to the VIDEO/AUDIO jacks on the back of the Receiver. The sound level and quality at the TO AUDIO AMP jacks is continuously adjustable by the Receiver VOLUME ▲ or VOLUME ▼ buttons and BASS, TREBLE and BALANCE controls. Sound level may also be controlled by Remote Control.

NOTE: These direct input jacks are for video accessories that provide separate video and audio output jacks. Such jacks are typically labeled VIDEO OUT and AUDIO OUT and may be directly connected to the jacks on this TV set. Video accessories that provide only antenna outputs (usually labeled ANT) must be connected to the VHF antenna terminals. Refer to accessory operating instructions for the proper connections.

TO CONNECT OPTIONAL EQUIPMENT
(Using the Audio and/or Video Jacks on Back of Set)

SIGNAL LEVEL & TERMINAL IMPEDANCE

TERMINAL (RCA)	LEVEL	IMPEDANCE
INPUT - Video INPUT - Audio	1V p-p 500 mV rms for max output	75 ohms More than 10K
TO AUDIO AMP	0-500 mV rms (variable)	Into more than 10K load

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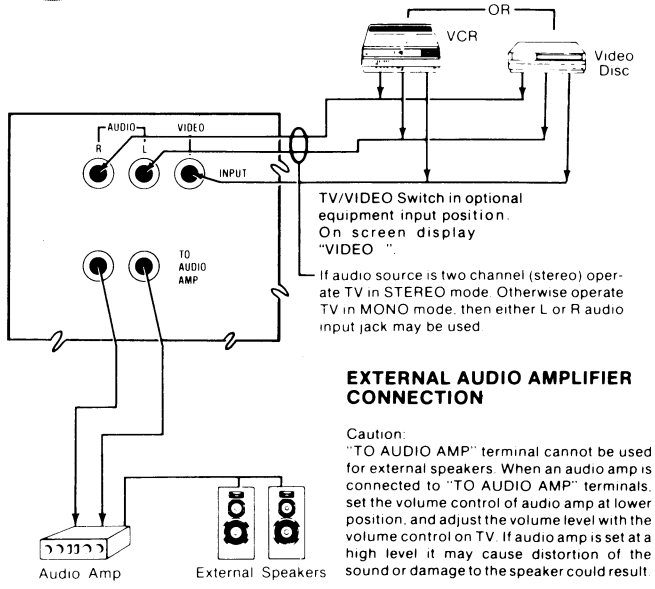
EXTERNAL VIDEO EQUIPMENT CONNECTION TO VIDEO & AUDIO INPUT


OR
VCR
Video Disc
AUDIO
VIDEO
R
L
INPUT
TO AUDIO AMP
TV/VIDEO Switch in optional equipment input position. On screen display "VIDEO".
If audio source is two channel (stereo) operate TV in STEREO mode. Otherwise operate TV in MONO mode, then either L or R audio input jack may be used.
Audio Amp
External Speakers

EXTERNAL AUDIO AMPLIFIER CONNECTION

Caution:
"TO AUDIO AMP" terminal cannot be used for external speakers. When an audio amp is connected to "TO AUDIO AMP" terminals, set the volume control of audio amp at lower position, and adjust the volume level with the volume control on TV. If audio amp is set at a high level it may cause distortion of the sound or damage to the speaker could result.

ANTENNA BUTTON

Each press of the ANT button at the Receiver or Remote Control, alternately switches receiver between ANT 1 and ANT 2 inputs. This feature permits remote control selection of:

A. Cable TV channels.
B. Video accessory such as:

Video tape recorder/player.
Video game.
Computer terminal.
Video disc player.
Pay TV converter box including descrambler (if more than one pay TV channel is subscribed to, it will be necessary to manually change converter from one pay channel to another).

Tune receiver to output of accessory (usually channel 3 or 4).

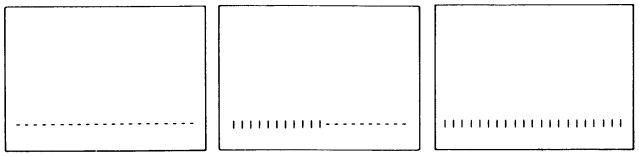
When ANT 2 input is in use, ANT 2 will display on screen.

When ANT 1 input is in use, CH and channel number will display on screen. (normal TV operation).

See ANTENNA CONNECTION section of this manual for required hookup.

ON SCREEN VOLUME READOUT

This is a horizontal row of short green bars near the bottom of the screen that appear whenever VOLUME ▲ or VOLUME ▼ is activated at the remote or set buttons.



Minimum Volume | Mid Volume | Maximum Volume

FEATURES ACTIVATED BY TV (ONLY)

S-VHS (S-VIDEO)

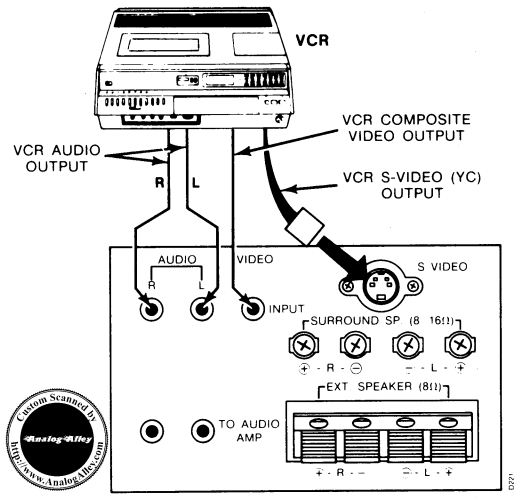
Your set is ready for the latest development — S-VHS VCR System. This new VHS system utilizes wide bandwidth recording and playback capability, as well as special image processing, to deliver improved picture quality with much higher resolution than standard VHS. To make use of this new technology a special input jack marked S-VIDEO is located on the back of your TV set.

OPERATION

1. Select VIDEO position of TV/VIDEO switch on Remote Control or Receiver Panel (optional accessory Video/Audio jacks activated). See TV/VIDEO SWITCH section of this manual.
2. Select S-VIDEO or VIDEO position of S-VIDEO /VIDEO switch on Receiver Panel.
   - S-VIDEO position — S-VIDEO TERMINAL ON SET BACK IS ACTIVATED - To view S-Video recording.
   - VIDEO position — VIDEO INPUT JACKS ON SET BACK ARE ACTIVATED - To view standard recording.
3. Operate VCR according to VCR Operating Manual.
4. To return to normal TV, press TV/VIDEO button on Remote Control or Receiver Panel. CH and channel number will display on screen.

NOTE: Be sure you have S-VIDEO switch in S-VIDEO position when using the S-VIDEO input (YC) terminal.

VCR CONNECTIONS



TERMINALS ON BACK OF TV SET

NOTCH FILTER BUTTON

Used to reduce some cross color interference that can be caused by chroma mixing with video and being apparent on horizontal lines. This interference is not always readily apparent so in most cases Notch Filter should be left in OFF (▙) mode unless you can see some improvement in picture when you turn it ON (▬).

FEATURES ACTIVATED BY REMOTE (ONLY)

MUTE

Push MUTE to turn sound off. (Red MUTE will display for 5 seconds). Push MUTE again or VOLUME ▲ or VOLUME ▼ and sound will return. Volume bars will display on bottom of screen for 5 seconds.

RECALL

Recall button activates the on screen display at anytime for a few seconds. It can be used to determine CHannel being viewed, TIME OF DAY, or SLEEP TIMER turn-off status, AUDIO MODE and ANT 2 (only if selected with ANT button).

RAPID TUNE

This feature allows the viewer to switch back to the last channel tuned immediately before the channel now being viewed. Repeated operation of R-TUNE button switches the Receiver back and forth between the last two channels tuned.

To use this feature, just enter the 2 desired channels in succession and then use R-TUNE button.

SLEEP TIMER

This feature will turn the set off automatically after a time lapse of 30, 60 or 90 minutes.

Press remote control SLEEP button. Each press advances time intervals of 30 minutes i.e. 30-60-90. Pressing the button at 90 will turn sleep timer off. ("00" minutes).

During the sleep timer countdown for turning the set off, a press of the remote control RECALL button will display the time status in red. Pressing the SLEEP button will advance the time to the next highest 30 minute interval.

PRESS **RECALL** DISPLAY 0-29 min., PRESS **SLEEP,** time DISPLAY to 30 min.

PRESS **RECALL** DISPLAY 30-59 min., PRESS **SLEEP,** time DISPLAY to 60 min.

PRESS **RECALL** DISPLAY 60-89 min., PRESS **SLEEP,** time DISPLAY to 90 min.

SLEEP TIME REMINDER

The Sleep Timer display will remind you at 3, 2 and 1 minute that the set is about to turn off. A 3 (flashing) when 3 minutes remain, 2 (flashing) when 2 minutes remain and 1 (flashing) when 1 minute remains will display for 5 seconds.

REMOTE CONTROL VCR OPERATION

This Remote Control is designed especially to be used with selected Panasonic VCR's. Some model VCR's have different functions, so please refer to the individual instruction booklet to ensure campatibility when using this remote control with VCR.

SURROUND

Each press of SURROUND button on Remote Control chooses between SURROUND ON or SURROUND OFF (will display on screen).

SURROUND STEREO

The built in Surround Sound circuitry can bring home the feel of the concert hall. By connecting an additional pair of speakers (optional), surround sound with audio delay is the ideal way to enjoy TV broadcast stereo. Surround sound can also simulate stereo sound from a mono source, making non stereo broadcasts more entertaining.

To use the Surround Sound system, install two speakers (optional) preferably behind or optionally to the sides of viewers. Connect speakers to L and R SURROUND SPEAKER terminals on back of set. (8 or 16Ω (ohm) with a minimum of 85dB efficiency).

The performance of the Surround System will be determined by position, efficiency and sound quality of the speakers. If necessary consult with your local dealer regarding speaker selection.

When the stereo effect is large (large difference between L & R) such as crowd scenes, outdoor sporting events, etc., sound output at the rear will be maximum, giving the viewer the desired surround effect. For voice, sound is localized to the front since there is little difference between the left and right signals.

To activate Surround Stereo feature press SURROUND button on Remote Control. See SURROUND.

Two modes of Surround Stereo are available. These are selected by SURROUND STEREO switch on Receiver Panel:

MUSIC mode is selected by SURROUND STEREO button OUT ▮ position.

MOVIE mode is selected by SURROUND STEREO button IN ▬ position. In the Movie mode, audio response is modified to pay particular attention for best response to voice.

Select the mode that sounds best to you.

SERVICE NOTES

IMPORTANT: To protect against possible damage to solid state devices due to arcing or static discharge, make certain all ground wires and CRT DAG wire are securely connected.

CAUTION: The power supply and horizontal drive circuits are above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing to avoid damage to test equipment or chassis. Connect test equipment to correct ground (⏚) or (⏚) when servicing or incorrect readings will occur.

WARNING: This receiver has been designed to meet or exceed applicable safety and X-radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X-radiation and shock and fire hazard, the parts shown in the :BOXED: areas of the schematic must be replaced with identical replacement parts. Order parts from the manufacturer's parts center using numbers shown in this service manual or give complete chassis number and part reference number.

For optimum performance and reliability, all other parts should be replaced with components having identical specifications.

HORIZ OSC DISABLE CIRCUIT

This chassis employs a special circuit to protect against excessive high voltage. If, for any reason, the high voltage and beam current exceeds a predetermined amount, this circuit operates and detunes the horizontal oscillator. This limits high voltage.

The over-voltage protection circuit is not adjustable. However, if components in the :BOXED: areas of the schematic in either the horizontal sweep system or the over-voltage protection circuit itself are changed, the operation of the circuit should be checked using the following procedure.

Equipment needed to check disable circuit:

1. Accurate voltmeter (0 - 200V scale)
2. High Voltage Meter (0 - 40kV)
3. Variac and Isolation Transformer

Procedure

NOTE: The disable circuit operation is checked by measuring the high voltage while B+ voltage is raised, and observing the point at which the horizontal oscillator goes out of sync.

1. Tune in a station to make sure horizontal is in sync.
2. Adjust Bright and Picture controls so that the picture is just barely visible. Set Color control to minimum.
3. Turn off receiver and connect a jumper wire across R804.
4. Connect high voltage meter to 2nd anode terminal on CRT.
5. Connect receiver to a variac through an isolation transformer. Set variac output to 90 volts AC.
6. Turn on receiver. Slowly increase variac AC voltage while observing high voltge until horizontal goes out of sync. Keep brightness low, so picture is just visible.
7. Horizontal should go out of sync below 34.4kV. If the voltage is not within specified limits, the cause should be determined.
8. If the voltage is within specified limits, turn set off, remove jumper from across resistor.
9. With variac set the voltage input to receiver at 120V AC. Confirm that B+ is 130.5V ±1V at TP91, with Bright, Picture and Color controls set to minimum.
10. Disconnect test equipment.

DISASSEMBLY FOR SERVICE

A, H, E, X, W, Z BOARDS

The A, H, E, X, W, Z boards and R unit, Q board mounting bracket are all part of the main chassis assembly that slides out on chassis rails.

1. Remove 3 screws from the front control compartment. (They are pointed out by arrows that show their location).
2. From the rear of the chassis remove the small K Board - Power Switch secured to a plastic bracket with 2 screws.
3. Unplug black static discharge wire (A39) from A Board.
4. Slide chassis assembly back and tilt to service A Board.

NOTE: Loosen board wires from chassis ties and clamps as required for further disassembly.

H-BOARD — SURROUND SOUND

1. Remove rear plastic bracket secured by 3 screws.
2. Board is fastened to a metal support bracket behind the board with 1 screw.

E-BOARD — STEREO/SAP

1. Plugs directly into main board (A) connectors A5 & A10.
2. Secured with 1 screw to metal support bracket.
3. Disconnect all necessary plugs for complete removal.

X-BOARD — AUDIO/VIDEO SWITCHING & AUDIO POWER AMP

1. Plugs directly into main board (A) connector A11.
2. Secured with metal support bracket by 2 screws (1 at top of bracket and 1 removed from bottom of circuit board). Also remove from bottom of circuit board 1 screw that secures IC2301 heat sink to main board.
3. Disconnect all necessary plugs for complete removal.

W-BOARD — COMB FILTER & S-VIDEO SWITCHING

1. Board is soldered to main board (A) at connectors A16 & A17.
2. Disconnect all necessary plugs for complete removal.

Z-BOARD — PINCUSHION

1. Board bracket is secured by 2 screws.
2. Remove 2 screws to release board from bracket and unplug all necessary plugs for complete removal.

The Q Board - Controls, R Board - Remote and K Board - Power Switch are mounted to a bracket that is fastened to the front of the A Board by plastic rails.

1. Press inward on rails to release control block from A Board.

R-BOARD — REMOTE ASSEMBLY

1. Use a small screwdriver to gently lift plastic clips out of the remote unit slots. Pull unit out.

Q-BOARD — CONTROLS

1. Release all wires from assembly tabs and slots. Clips and 1 screw secure the board.

K-BOARD — POWER SWITCH

Secured by plastic clips.

The C Board-CRT and V Board-Velocity Modulator are mounted on the picture tube neck.

C-BOARD — CRT

1. Plugs into socket on CRT neck.

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V-BOARD — VELOCITY MODULATOR

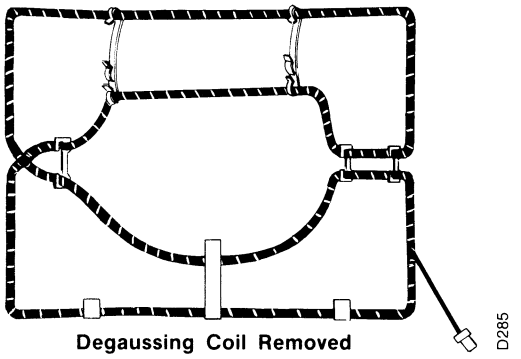
This board is part of the convergence/purity magnet assembly (CPM). To service the board remove complete CPM assembly from neck of CRT. (Note: Do not disassemble board from CPM. Breakage or unsoldering of ribbon cable connection between B board and CPM opens the circuit).

DISASSEMBLY FOR CRT REPLACEMENT

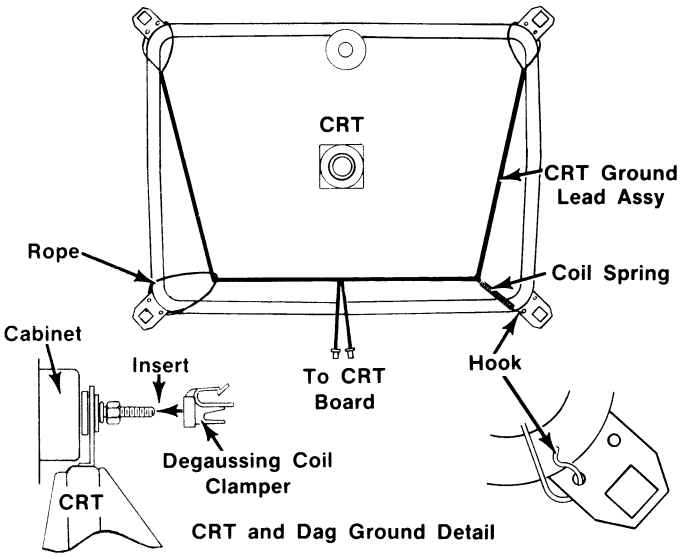
1. Discharge CRT as instructed in Safety Precautions.
2. Disassemble main chassis assembly as instructed in Disassembly For Service.
3. Remove C-Board from CRT base socket and unplug 2 dag ground wires.
4. Disconnect V1 plug from V-Board (Velocity Modulator), Yoke plug DY from A-Board (main chassis), Degaussing coil plug DEG from Z-Board (pincushion).
5. Remove Audio Power Transformer (T2401) by prying up on tab on the bottom of the mounting block and pull out.
6. Remove 2nd anode button from CRT and release anode lead from clamps on degaussing coil.
7. Remove main chassis and accessory assemblies from cabinet.

CRT REPLACEMENT

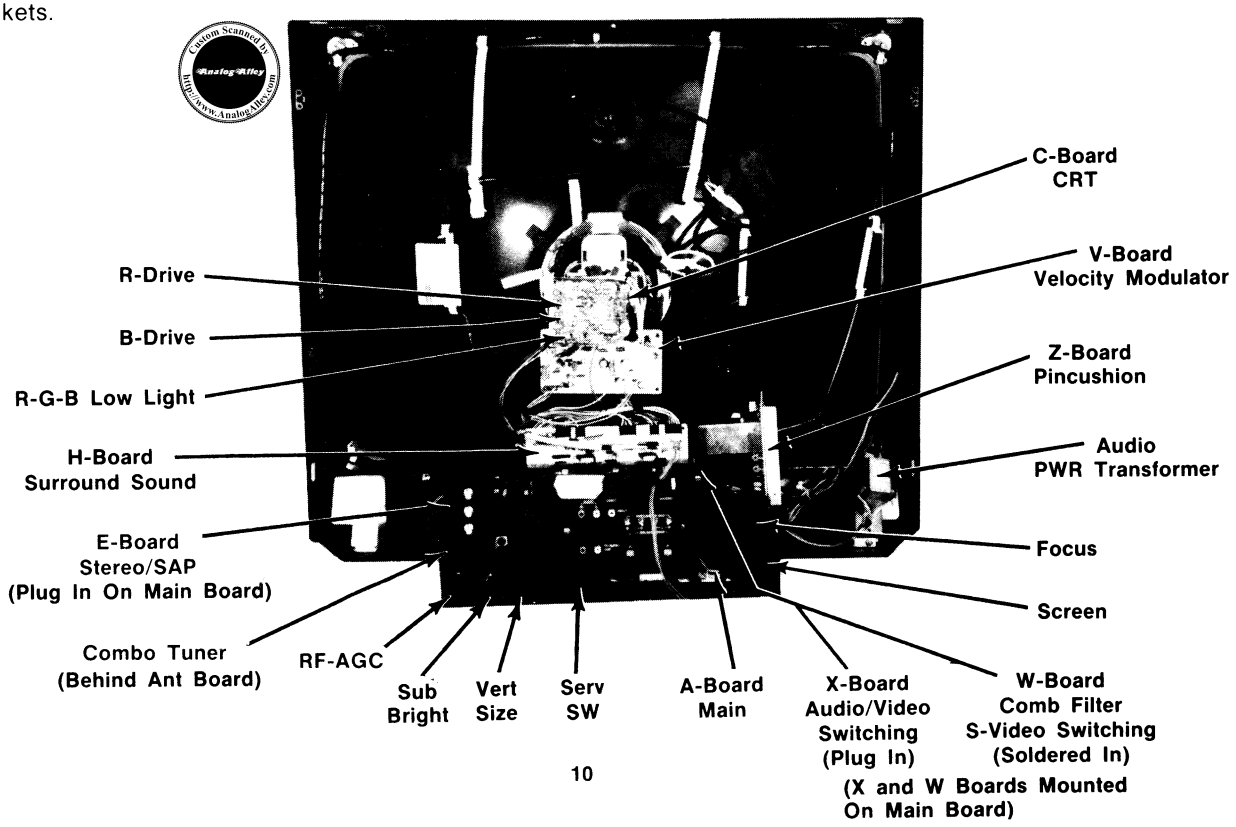
1. Perform DISASSEMBLY FOR CRT REPLACEMENT.
2. Insure CRT H.V. anode button is discharged before handling CRT. See SAFETY PRECAUTIONS on handling the picture tube.
3. Remove degaussing coil by releasing the degaussing coil from clampers at each corner of the CRT. (Note: There is no need to release any other clamps on the degaussing assembly).
4. Remove components on CRT neck and place cabinet face down on a soft pad.
5. Remove the 4 degaussing coil clampers from each CRT corner bolt by unscrewing them.
6. Remove CRT mounting nuts from each corner and remove CRT with dag ground braid attached.
7. Remove dag ground braid by unhooking coil spring from lower right CRT bracket and rope loop from lower left CRT bracket, Release braid ends from upper left and upper right corner brackets.
8. Mount dag ground braid on replacement CRT. Mount replacement CRT in cabinet. (Note: The order of assembly to the cabinet bolt is washer, rubber cushion, CRT bracket and then nut).
9. Push the degaussing coil clampers on each corner bolt and replace degaussing coil.
10. Replace components on CRT neck and re-install main chassis and accessory assemblies into cabinet. Make sure all plugs get connected.



Degaussing Coil Removed



CRT and Dag Ground Detail



(X and W Boards Mounted On Main Board)

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SERVICE ADJUSTMENT PROCEDURES

ALL SERVICE CONTROLS ARE FACTORY PRESET AND SHOULD NOT REQUIRE ADJUSTMENT UNLESS CONTROL AND/OR ASSOCIATED COMPONENTS ARE REPLACED.

NOTE: CONNECT MINUS LEAD OF VOLTMETER TO CORRECT GROUND FOR CIRCUIT BEING CHECKED. LINE OPERATED GROUND TP92 AND JE1 (⏚) ONLY FOR POWER SUPPLY, Q501 HORIZONTAL DRIVER AND Q551 HORIZONTAL OUTPUT TRANSISTOR CIRCUITS. FOR ALL OTHER CIRCUITS, CONNECT MINUS LEAD OF VOLTMETER TO LINE ISOLATED GROUND (⏚) TPB3, IF SHIELD, IC451 HEAT SINK.

130.5V B+ VOLTAGE CONFIRMATION

Automatic regulation by IC801. There is no B+ adjustment control.

1. Set Bright, Picture and Color customer control to minimum (fully CCW).
2. Connect a DVM between TP91 and line operated ground (TP92).
3. Confirm that B+ voltage is 130.5V ±1.0V.

SOURCE VOLTAGE CHART

120V AC line input. Bright and Picture controls minimum. ColorPilot Off. Use isolated ground (TPB3) for minus lead of DVM.

TPD7	+12V ±1V
TPD8	+26V ±2V
TPD9	+16V ±1.5V
C32	200V ±15V (CRT Board)

HIGH VOLTAGE CHECK

1. Select an active TV channel and confirm that horizontal is in sync.
2. Follow above B+ voltage adjustment procedure.
3. Using a calibrated high voltage meter confirm that High Voltage is 29.5kV (+1.0kV, -1.5kV).

RF AGC DELAY R101

Adjust only if overloading on strong signal or busy background (snow) is present on moderate strength signals.

1. Set Picture to maximum.
2. Adjust RF AGC control R101 until snow appears in picture, then adjust control until snow is eliminated.
3. Check all channels for optimum setting.

AFC FIELD ADJUSTMENT L152

1. Turn AFC switch OFF and set TV/CABLE switch to TV position.
2. Connect a digital voltmeter to AFC test point TP16.
3. Check all active High Band channels 7~13 for AFC voltage range. Select channel with AFC voltage in approximate center of voltage range.
4. Adjust L152 for 6.5V ±0.1V at TP16.
5. Set AFC switch on and check all active channels for proper AFC correction. Touch up L152 if required.

NOTE: Do not use CATV/MATV channel with offset carriers for adjustment or in determination of low and high range of AFC voltage.

AUTOMATIC BEAM LIMITER (ABL)

SUB-BRIGHTNESS CONTROL R316

This is factory set and no adjustment is usually required unless repairs are made to the main board brightness circuit, CRT board circuits or the CRT is replaced.

NOTE: Operate television for minimum of 10 minutes prior to adjustment.

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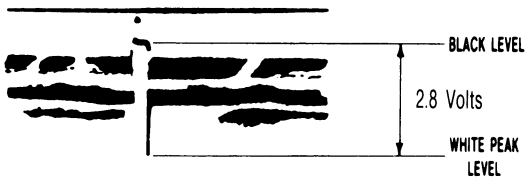
1. Set Bright to max. (CW). Picture and Color controls to minimum (CCW).
2. Set ColorPilot and AFC switch to OFF position.
3. Select active channel with high white (highlights) content.
4. Adjust Sub-Brightness control so picture highlights are just visible.
5. Set Bright control to detent position, Picture control to maximum. Adjust Color and Tint controls for normal picture.
6. Check all active channels. If brightness is too high with Bright control in detent position, reduce setting of Sub-Bright control.

NOTE: Sub-Brightness control setting limits CRT conduction to avoid excessive beam current. This adjustment must be made after sub-contrast control or color temperature tracking adjustments are made. Do not adjust Screen control after Sub-Brightness is set.

SUB CONTRAST R309

CAUTION: Do not adjust unless control is replaced or control was accidently misadjusted.

1. Check Video Level Control R3003 adjustment. Readjust if required.
2. Connect oscilloscope to TP13 (A board). Use IF metal shield for scope cold ground connection. Set scope horizontal time base to 2ms (vertical).
3. Connect a wire jumper from TPD2 to TPB3 (cold ground).
4. Set customer front panel controls:
   - Bright to detent position and Picture to maximum (CW).
   - Sharpness and Color to minimum (CCW).
   - ColorPilot and AFC switch off.
5. Select channel that transmits the VIT signal (Vertical Interval Test).
6. **With small screwdriver tip, short out C402 by IC301. Picture should roll down.**



Sub Contrast Video Waveform Detail

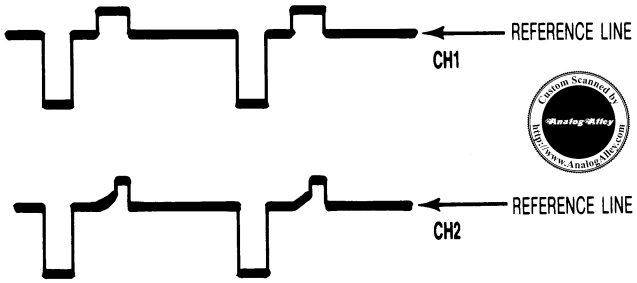
7. Set scope trigger (sync) to lock in video waveform (see detail). Blanking pulse will run through scope display but will not blank out black level or VIT white level spike. The first signal spike after blanking (video waveform) is the VIT signal white level.
   NOTE: On a two channel oscilloscope, use the second channel for trigger pulse by connecting its input to TP12 (video waveform).
8. Adjust Sub Contrast control R309 for 2.8V pp ±0.1V pp from white level to black level on video waveform (see video waveform detail).
9. Remove jumper wire (Step 3).

REFERENCE GYRATER ADJ. (R612)

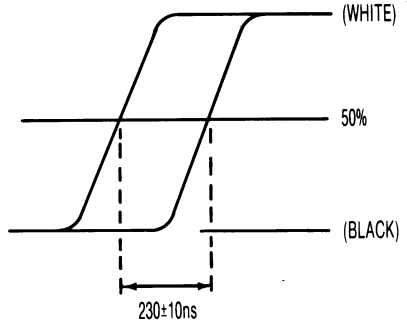
This adjustment procedure should be performed when repairing the comb filter circuit or replacing IC301.

The adjustment compensates video delay whenever the delay line doesn't produce enough delay of the video signal.

1. Apply NTSC color bar signal (not rainbow generator) to antenna terminal.
2. Set Brightness to detent position, Picture to mid position.
3. Using a dual trace oscilloscope, connect CH1 probe to junction of R345 and R309 (Sub Contrast).
4. Connect CH2 probe to TP13. (Invert CH2 signal by using polarity switch on oscilloscope).
5. Set scope as follows:
   - DISPLAY MODE — CHOP
   - DLY TIME — 20μs
   - Adjust amplitude of CH1 and CH2 so signals are equal.
   - Adjust trigger slope control to stabilize signals as shown.



6. Join two signals together with CH1, CH2 position controls so reference lines are in identical position.
7. Set DLY TIME control of oscilloscope to 2μs. Expand signal with Mag (x10). Adjust FINE POSITION until signal shows the following.



8. Adjust R612 so time delay of two signals is 230±10ns as shown above.

COMB FILTER ADJUSTMENT - R3252 (W BOARD) AND L304 (A BOARD)

1. Connect an NTSC color bar generator (not rainbow generator) to antenna or select a TV channel with a color program.
2. Connect an oscilloscope to TP13 on A Board.
3. Set oscilloscope sweep rate to view color burst signal on horizontal sync pulse.
4. Set balance control R3252 on W Board fully clockwise. Burst amplitude should increase making it more visible.
5. Adjust phase coil L304 on A Board for minimum burst amplitude.
6. Re-adjust balance control R3252 for minimum burst amplitude.

VERTICAL SIZE R405

1. Turn vertical size control R405 CCW until top and bottom edges of raster are visible.
2. Adjust vertical size control CW until top and bottom of raster touch bezel edge. Advance size control CW an additional 30 degrees. This will be approximately 10% overscan. Linearity adjustment is automatic with size adjustment.

FOCUS (PART OF T551)

Adjust the Focus control to obtain the sharpest and clearest picture.

SOUND ALIGNMENT T201/L201

1. Select active TV channel.
2. Attenuate signal (loosely couple antenna lead or use RF attenuator pad) for noisy sound.
   - Adjust T201 for maximum sound. Signal to noise ratio is best when T201 is peaked.
3. Connect antenna or remove RF attenuator for strong signal.
   - Adjust L201 for best sound.

COLOR TEMPERATURE ADJUSTMENT (B/W TRACKING)

Minor Touch-Up Method

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for "good grey scale and warm highlights".

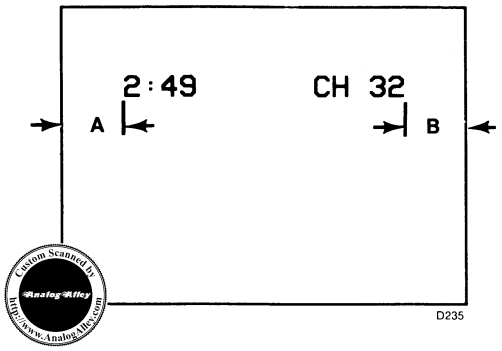
- LOW LIGHT areas - adjust LOW LIGHT controls (R354. R361. R368) for grey.
- HIGH LIGHT areas - adjust DRIVE controls (R356, R370) for warm whites.

Complete Adjustment

1. Allow 10 minutes warm up at high brightness.
2. Select active TV channel, B/W program if available.
3. Preset customer controls:
   (a)COLOR, BRIGHT AND PICTURE to minimum (CCW).
   (b)AFC switch OFF. COLORPILOT switch ON.
4. Set CRT BOARD controls:
   (a)Red and blue DRIVE 90 degrees counter-clockwise from max clockwise.
   (b)Red, Green, Blue LOW LIGHT to center position.
   (c)SCREEN to minimum counterclockwise.
5. SERVICE switch to SERVICE position.
6. To set LOW LIGHT controls:
   (a)Turn SCREEN control until first color horizontal line appears. Do not adjust that color LOW LIGHT control during following steps.
   (b)Adjust other 2 LOW LIGHT controls for white line.
7. Set SERVICE switch to NORMAL position. Turn up BRIGHT control for low level brightness condition.
8. Adjust other two LOW LIGHT controls for low level grey scale picture.
9. Turn BRIGHT and PICTURE controls to maximum and adjust DRIVE controls for warm whites.
10. Reduce brightness and recheck low level grey scale. Re-adjust LOW LIGHT controls if necessary. NOTE: Do not adjust Low Light control of color in Step 6(a).
11. Perform SUB-BRIGHTNESS (ABL) control adjustment.

ON SCREEN DISPLAY POSITIONING

1. Select active channel.
2. Set customer controls for low brightness condition.
3. Depress and hold PROG button. Channel and time will display.
4. While PROG is depressed adjust C065 so dimension A = dimension B as shown in detail.



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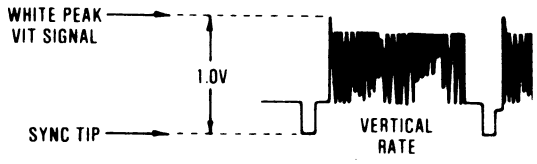
REFERENCE OSCILLATOR C036 FOR FREQUENCY COUNTER WITH TIME BASE READOUT ($\frac{1}{F}$)

1. Connect meter to TPS1. (Use line isolated ground ⏚).
2. Select any active channel and set volume at approximately mid position. Do not mute sound.
3. Set C036 trimmer capacitor for 64.0μ sec.

VIDEO LEVEL R3003 - X BOARD

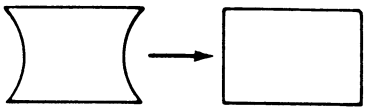
CAUTION: Do not adjust unless control has been replaced or control was accidentally misadjusted.

1. Connect oscilloscope to Plug X11 Pin 5 (X Board). Use cold ground for scope connection. Set scope horizontal time base for vertical (2ms).
2. Select a channel that transmits the VIT signal (Vertical Interval Test).
3. Adjust R3003 (X Board) for 1 volt p-p from sync tip to white peak level. White peak is first signal spike after blanking. See detail.
4. Check Sub Contrast adjustment.



PINCUSHION ADJ R761 - Z BOARD

1. Connect crosshatch generator to the antenna terminals.
   a. Set customer controls
      - Picture to max. (CW)
      - Bright to click
      - Sharpness to mid
      - ColorPilot switch "OFF"
2. Set H-WIDTH control (R760) and H-CENTER control (R524) to MID position.
3. Adjust parabola control R761 for straightest left and right vertical lines.



4. If needed, adjust Horizontal Size with (R760) and H-CENTER (R524) so center square of crosshatch pattern is centered on CRT.

E BOARD ADJUSTMENTS - STEREO

The Stereo/SAP adjustments require special equipment. Do not "touch up" adjustments as this will result in deterioration of the stereo or second audio program signal. The adjustments are covered in a separate manual.

PURITY AND CONVERGENCE PROCEDURE

Adjustment should be necessary only if the CRT or deflection yoke is replaced or if someone has disturbed the setting. The complete procedure consists of:

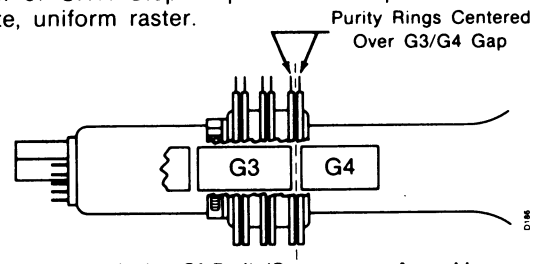
1. Initial static convergence
2. Setting purity
3. Final static convergence

WHEN CRT OR YOKE IS REPLACED

Place the yoke on the CRT neck (do not tighten clamp).

Position purity/convergence assembly as shown and tighten clamp snugly. Cut wax seal on assembly and place like tabs of purity device together at 12 o'clock to reduce its magnetic field effect. Manually degauss CRT.

Turn set on and slide deflection yoke back and forth on neck of CRT. Stop at position that produces a near white, uniform raster.



Positioning Of Purity/Convergence Assembly

INITIAL CENTER STATIC CONVERGENCE

Connect dot/crosshatch generator to receiver and tune in signal. Observe misconvergence at center of screen only.

Adjust 4 pole magnet (center rings): separate tabs and rotate device to converge blue with red.

Adjust 6 pole magnet (rear rings): separate tabs and rotate device to converge blue and red (magenta) with green. NOTE: Precise convergence at this point is not important.

PURITY ADJUSTMENT

Operate the receiver for 60 minutes with BRIGHT control at maximum to stabilize the CRT.

Degauss the receiver fully by using an external degaussing coil.

Short TP14 to ground for blank raster. Set BRIGHT control to detent.

Turn red and blue LOW LIGHT controls fully counterclockwise to obtain a green field. Adjust DRIVE controls if green field is not obtained. Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.

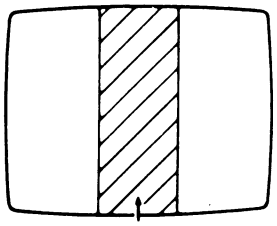
Adjust the purity magnet to set the vertical green raster precisely at the center of the screen. (Shown below)

Slowly move the deflection yoke forward and adjust for the best overall green screen.

Tighten the deflection yoke clamp screw.

Produce a blue and then red raster by LOW LIGHT controls and observe that good purity is obtained on each respective field.

Observe that uniform white raster is obtained by adjusting LOW LIGHT controls. If screen is not uniformly white, repeat above procedure.



Green Raster

FINAL CONVERGENCE ADJUSTMENT

NOTE: Before attempting convergence adjustment, vertical size and focus adjustments must be completed. Connect a dot pattern generator to the set. The brightness level should be no higher than necessary to obtain a clear pattern.

Converge the red and blue dots at the center of the screen by rotating the 4 pole (R with B) Static Convergence Magnets.

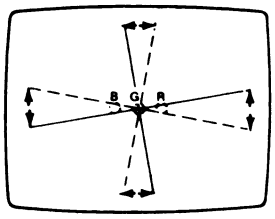
Align the converged red/blue dots with the green dots at the center of the screen by rotating the 6 pole (R/B with G) Static Convergence Magnets. Melt wax with soldering pencil to reseal magnets.

Slightly tilt (do not rotate) the deflection yoke vertically and horizontally to obtain good overall convergence.

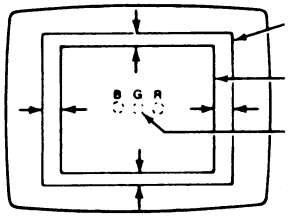
After vertical adjustment of the yoke, insert wedge at 11 o'clock position, then make the horizontal tilt adjustment.

Secure deflection yoke by inserting side two wedges at 3 and 7 o'clock positions.

Apply adhesive between tab (thin portion) of wedge and CRT and place tape over tab to secure to CRT.



As the yoke is moved vertically, the rasters produced by the outside guns rotate in opposite directions

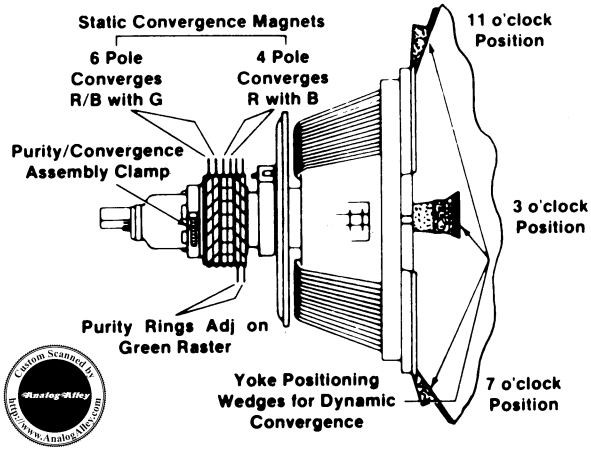


Raster produced from one of the outside electron beams

Raster from the other outside electron beam

Static convergence magnets are set for center convergence

As the yoke is moved horizontally, one raster gets larger while the other gets smaller



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PERMALLOY CONVERGENCE CORRECTOR STRIP (PART NO. OFMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required.

First converge the set without the strip and observe the corners.

If correction is needed:

1. Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.
2. Press adhesive tightly to the CRT and secure with tape.

LEADLESS COMPONENTS INFORMATION

NAME OF PART / ITEM		CHARACTERISTICS	BODY COLOR	THE TYPE INDICATED BY COLOR CODE
Resistor	Carbon film resistor	Resistance value range: 1.0 ohm to 1.0M ohm Rated power: 1/4W Tolerance: ±5%	Ivory	Resistance value
	Metal film resistor	Temperature coefficient: 0±50 ppm/C° Rated power: 1/4W Tolerance: ±1%	Blue	Resistance value
	Fuse resistor	Rated power: 1/4W Tolerance: ±5%	Blue	Resistance value
JUMPER (Cross Conductor)		Max. rated current: 5A	Light brown	0 ohm jumper

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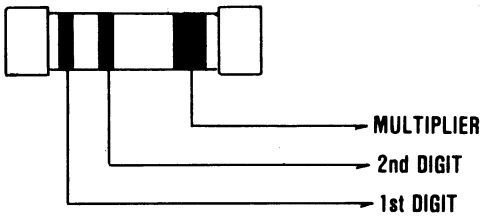


EXAMPLE

1ST DIGIT	2ND DIGIT	MULTIPLIER
RED	YELLOW	RED
2	4	00

COMPONENT REMOVAL

It is recommended that solder removing wick be used to aid in component removal. An iron with a temperature controlled heating element reduces the possibility of damaging the board due to over-heating.

CHASSIS WITH LEADLESS COMPONENTS

CAUTION: A 40 watt iron is recommended. Avoid prolonged heat which can damage circuit board.

This chassis has components mounted on both sides of the circuit boards. The bottom components are of the "leadless" type. Standard components can be used for replacement if mounting holes are available in the board. Otherwise a replacement leadless component, as specified in parts list, must be used.

To Remove Components

1. Use desoldering wick to remove solder from both ends of the component.
2. Without "pulling up", carefully twist the component with pliers to break the adhesive.

To Install Standard Replacement Components

1. Check for clearance on top side of board. NOTE:Replacement components may be installed from either top or bottom sides in most cases.
2. Cut leads short to prevent shorting to other components or circuits.
3. Mount components in place by running leads through holes in board, then solder on bottom side.

To Install "Leadless" Component

1. Put small amount of solder on board component soldering pads.
2. Hold component against soldering pads and apply heat to pad area with low wattage soldering iron until solder flows. Remove iron.
3. Continue to hold component against pads until solder solidifies.

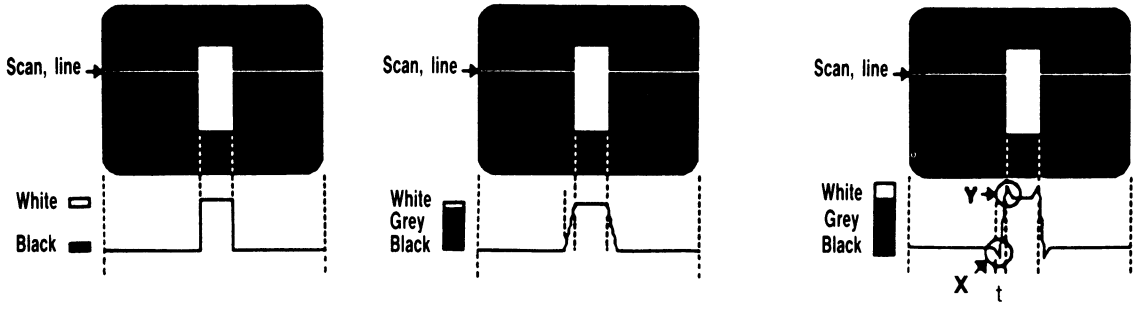
VELOCITY MODULATION PEAKING (VMP)

Peaking circuits in television receivers detect the edges of objects in the picture and then enhance the apparent sharpness by accentuating them. Effectively, this results in a white narrow outline around objects and can be accomplished in several ways. The most common form of "sharpness" control uses electrical peaking to increase the video drive at transitions. This, however, causes an increase in the spot-size of the electron-beam which is counter-productive. In addition, unwanted noise in the picture is exaggerated.

Velocity modulation peaking accomplishes the same thing without increasing the spot-size. The white outlining is produced by briefly slowing down the scanning beam at the edges so that the spot remains in the vicinity of the transition (edge) a little longer than it ordinarily would. This results in a sharper image but without the loss of real resolution that comes with increased spot-size and with a minimal effect on picture noise.

It should be noted that for the scanning beam to reach the edge of the screen at the proper time for normal TV scanning; when there is a momentary slowdown there has to be a compensatory momentary speed-up.

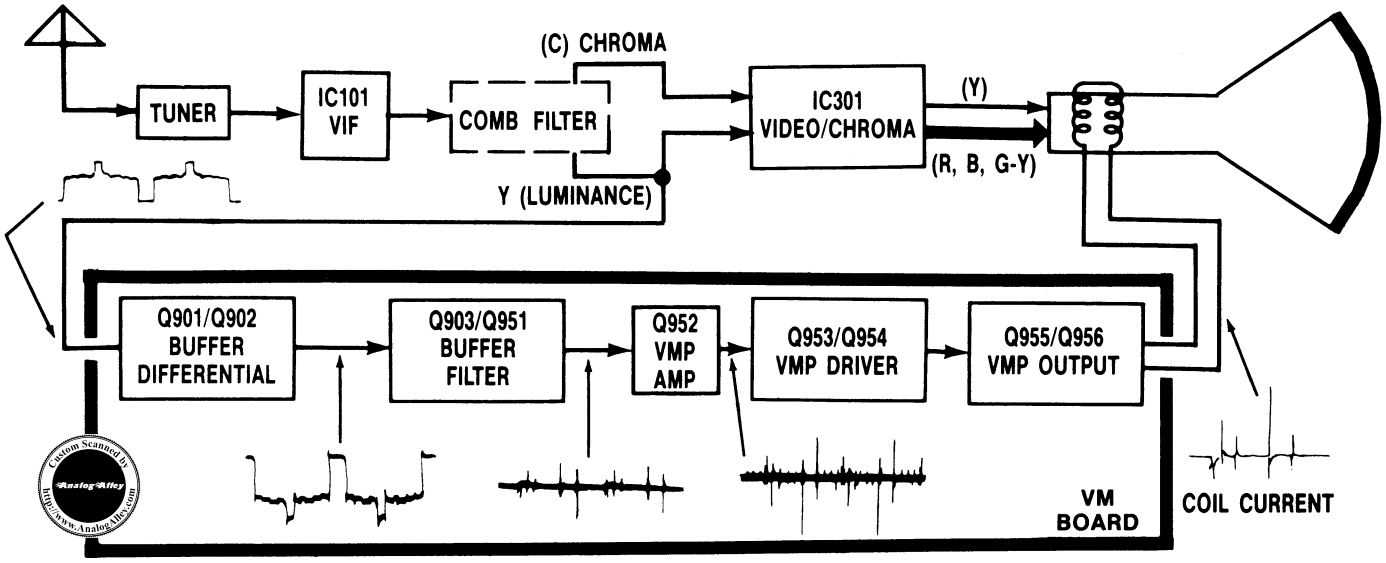
The momentary speed-up causes a narrow "blacker outline" (X in detail C below) in the same way that a momentary slowing-down causes a "whiter outline" (Y in detail C below). The net effect is that a transition that goes from black-to-white will be enhanced as shown below:



DETAIL A (IDEAL SIGNAL) | **DETAIL B (WITHOUT VMP)** | **DETAIL C (WITH VMP)**

The picture display on the screen in the above illustrations is a white rectangle against a black background. The signal diagrams illustrate the brightness level (from black to white) for one scan line. Detail A is the signal that the TV is trying to reproduce, i.e. black rising instantly to white at the leading edge of the rectangle, than falling instantly to black at the trailing edge.

The velocity modulation system consists of a circuit board and an auxiliary deflection coil housed in the convergence/purity magnet assembly which is mounted on the CRT neck behind the deflection yoke.



The operation is as follows:

The (Y) video signal is fed into the base of Q901 which serves as a buffer. Q902, which differentiates it, identifies the transistions. Q903 and Q951 buffer and filter out the low frequencies leaving only the information defining the edges. Q952 then amplifies this signal and feeds it to the drivers (Q953, Q954). Output stages (Q955, Q956) produce a current in the auxiliary deflections coil that coincides with the edges of objects.

In conjunction with the deflection yoke, this auxiliary deflection coil produces the necessary slowing down of the scanning beam (along with the necessary momentary speeding up).

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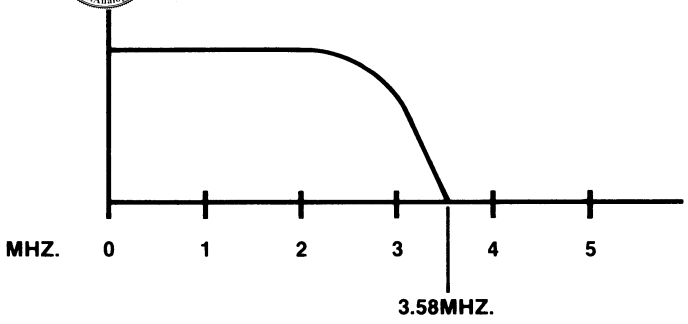
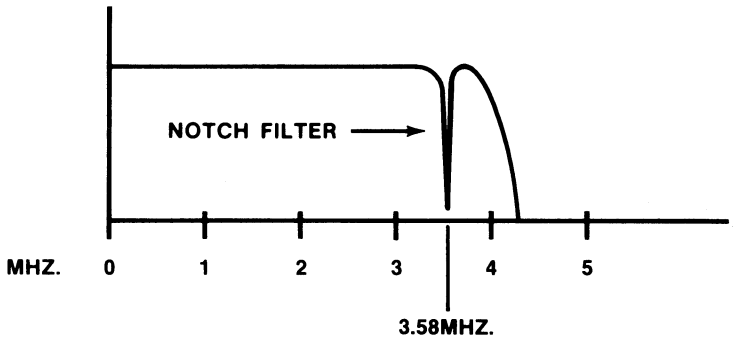
NOTCH FILTER



VIDEO BANDPASS - NO COMB FILTER

3.58MHZ. TRAP REDUCES VIDEO BANDWIDTH.



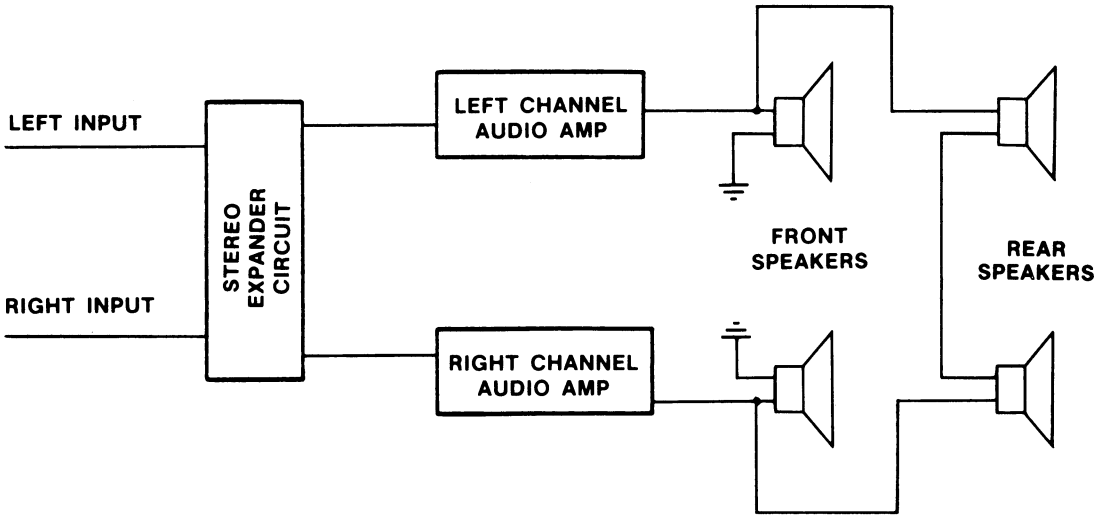
VIDEO BANDPASS - WITH COMB FILTER

COMB FILTER REMOVES CHROMA (3.58MHZ.) WITHOUT AFFECTING VIDEO BANDWIDTH.

NOTCH FILTER INCREASES ATTENUATION OF 3.58MHZ.

SURROUND SOUND DESCRIPTION

Two rear speakers are connected in series between the left and right outputs. When the stereo effect is large (large difference between left and right input), there will be maximum output at the rear. This gives the viewer the desired surround sound effect such as in crowd scenes or outdoor sporting events. For voice or non-stereo signal, sound is localized to the front since there is little difference between the left and right signals.



HORIZONTAL OSCILLATOR HOLD DOWN CIRCUIT

This circuit protects against excessive high voltage and CRT beam current. If for any reason high voltage and/or CRT beam current exceed a predetermined level, the hold down circuit operates to increase horizontal frequency and thus limit high voltage.

Horizontal retrace pulses, from pin 6 of flyback transformer (FBT) T551, are rectified by diode D531. The resultant positive DC voltage at the cathode of D531 is directly proportional to high voltage variations. This voltage is filtered and applied via R532/R533 resistive divider to pin 12 of IC301, the Overvoltage Hold Down circuit. Under normal operating conditions the hold down stage is inactive and has no effect on the horizontal frequency.

The hold down stage compares the voltage at pin 12 to a 6V zener clamped reference DC voltage at pin 14. If horizontal retrace pulse amplitude (representative of high voltage) increases, the positive voltage at the cathode of D531 and at pin 12 of IC301 also increase.

When the increased DC voltage at pin 12 exceeds the reference voltage at pin 14 by a predetermined amount, the Hold Down stage operates. It shunts the horizontal sync to ground. This in turn produces an increase in horizontal frequency causing the picture to pull horizontally and restricts high voltage within specified limits.

An increase in CRT beam current produces more negative ABL voltage at pin 3 of T551 (FBT) which is coupled to pin 14 of IC301 via resistor R538. This increased negative voltage opposes the positive voltage at pin 14 and brings the Hold Down stage closer to operation.

Thus, excessive levels of high voltage and/or increased CRT beam current causes detuning of the horizontal oscillator frequency to assure operation within safe limits.

As an added precaution to excessive radiation due to high voltage rising, there is a beam defeat circuit.

Q534 and Q531 conduct a short period of time after the shift in horizontal frequency and switch a DC voltage to pin 27 of IC301 which is normally 0V. This in turn opens a switch circuit in the IC that supplies the luminance signal to the color output transistors.

Q534 is connected in parallel with the same pins of IC301 that control the over-voltage hold down circuit. The emitter is connected to zener clamped 6V of pin 14. The base is connected to pin 12 which has the DC voltage derived from high voltage sampling. As this voltage rises the base voltage increases until a .6V bias voltage is attained between base and emitter. Q534 conducts and the collector voltage which is normally high drops. Q531 base tied to Q534 collector, now decreases in voltage and allows Q531 to conduct. Q531 acts as a closed switch and connects +12V to pin 27 of IC301. This voltage opens a luminance signal switch circuit in IC301 and turns off the CRT beam.

The B+ circuit and the Hold Down circuit are not adjustable. If components in the designated areas of the schematic for critical parts are changed, operation of the horizontal oscillator hold down circuit must be checked to insure that high voltage and CRT beam current does not exceed safe operation parameters. Check the following for possible failure.

1. Measure DC voltage at cathode of D531. Reading should be close to 20.5V.
   If not; check R531, D531, C531, R532, R533 and IC301.
2. Measure DC voltage at pin 14 of IC301. Reading should be 6V.
   If not; check R534, R535, D533, C502, R538 and IC301.

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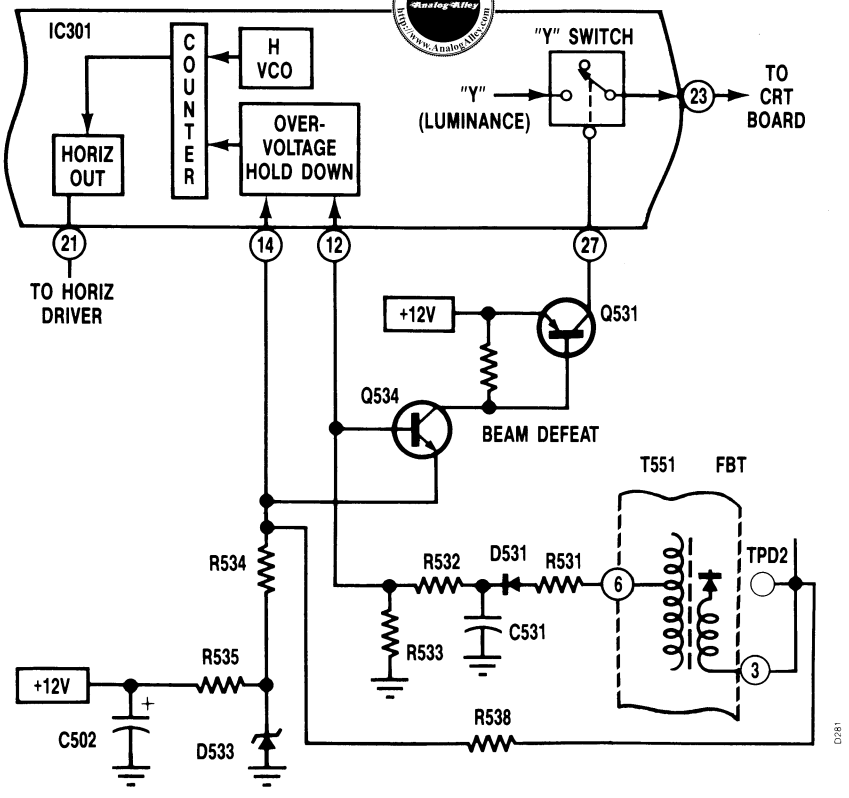
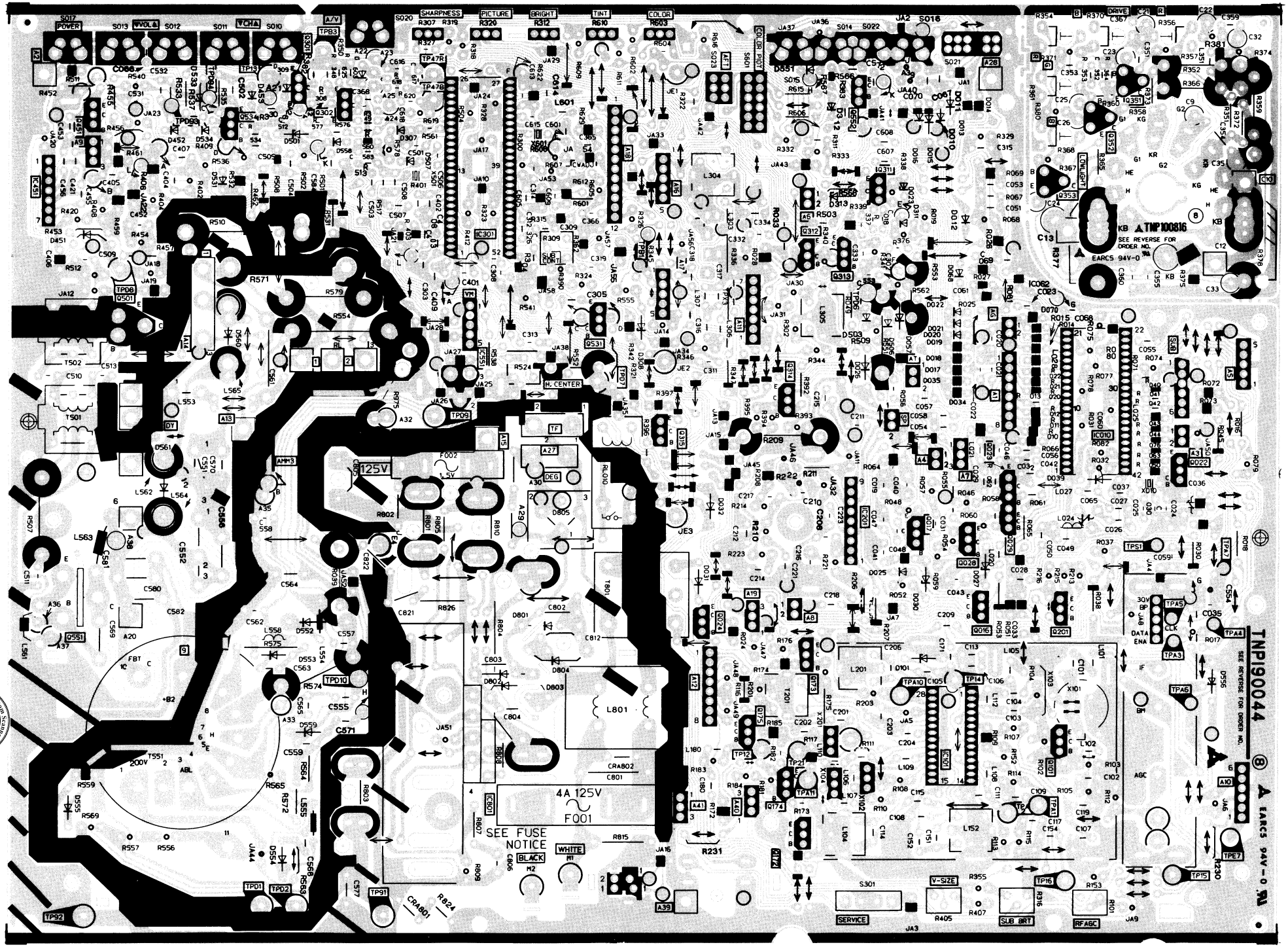


OVERVOLTAGE PROTECT CIRCUIT

A-BOARD TNP190044
Main



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A-MAIN, C-CRT, Z-PINCUSHION SCHEMATIC DIAGRAM

WAVEFORMS — SCHEMATIC A

1. 5.4V p-p[H]
2. 5.4V p-p[V]
3. 5V p-p[.2μs]
4. 5V p-p[5ms]
5. 7.5V p-p[H] (Mid. Vol. Range)
6. 4.8V p-p[5ms]
7. 2.5V p-p[V]
8. 60V p-p[V]
9. 190V p-p[H]
10. 14.5V p-p[H]
11. 1.8V p-p[H]
12. 1.7V p-p[H]
13. 1.8V p-p[H]
14. 1.9V p-p[H]
15. 2V p-p[H]
16. 260V p-p[H]
17. 30V p-p[H]
18. 160V p-p[H]
19. 250V p-p[H]
20. 1.7V p-p[H]
21. 720mV p-p[H]
22. 500mV p-p[H]
23. 2.5V p-p[V]
24. 1.2V p-p[V]
25. 2.5V p-p[V]
26. 1.6V p-p[H]
27. 4V p-p[H]
28. 4V p-p[H]
30. 360mV p-p[.5μs]
31. 6V p-p[H]
32. 3.7V p-p[H]
33. 6V p-p[H]
34. 2.6V p-p[H]

S/H

NOTES:

WAVEFORM MEASUREMENTS
TAKEN WITH A STANDARD GATED RAINBOW GENERATOR RECEIVER CONTROLS ADJUSTED AS FOLLOWS:

- PICTURE COLOR AND TINT TO MAXIMUM
- BRIGHTNESS TO DETENT
- COLORPILOT OFF
- AFC ON

ALL VIDEO AND COLOR WAVEFORMS TAKEN WITH WIDEBAND SCOPE AND A PROBE WITH LOW CAPACITY (10 TO 1), SHAPE AND PEAK TO PEAK AMPLITUDES MAY VARY DEPENDING ON CALIBRATION, TYPE OF TEST EQUIPMENT USED, AND CONTROL SETTINGS.

NOTE: GROUND SYMBOL ⏚ OR ⏚ INDICATES GROUND LEAD CONNECTION OF OSCILLOSCOPE.

CAUTION: INCORRECT GROUND CONNECTION OF TEST EQUIPMENT WILL RESULT IN ERRONEAOUS READINGS.

VOLTAGE MEASUREMENTS

1. Voltage measurement:
   - AC input to receiver is 120 V. Set tuned to Channel 4 with color bar generator connected to antenna.
   - Controls adjusted and switches set as follows:
     Sharpness - Max
     Picture - Max
     Brightness - Detent
     Tint - Max
     Color - Max
     ColorPilot - Off
     AFC - On
     TV-Cable SW - TV position
     Volume - Min
   - Voltage readings are nominal and vary ±10% on active devices.
     Some voltage readings will vary with signal strength and picture content.
   - Supply voltages are all nominal.
2. Ground symbol ⏚ or ⏚ indicates ground lead connection of meter. **Caution: Incorrect ground connection will result in erroneous readings.**
3. Unless noted otherwise, Feature switches as follows:
   AUDIO MODE — STEREO
   TV/VIDEO — TV
   SURROUND/STEREO — MUSIC (♫)
   S-VIDEO — VIDEO (▉)
   NOTCH FILTER — (OFF)

SCHEMATICS NOTES:

1. Resistors are carbon 1/4W unless noted otherwise.
2. Capacitors are ceramic 50V unless noted otherwise.
3. Coil value noted is inductance in μH. Coil resistances are in-circuit measurements and shown only when greater than 1 ohm ±20%.
4. Test point indicated by ⟨
5. When arrows [↗] used connections are easily found along with direction of arrow.
6. — **(BOLD LINES)** Indicates the route of B+ supply.
7. Ground symbol ⏚ or ⏚ indicates ground lead connection of meter. **Caution: Incorrect ground connection will result in erroneous readings.**
8. This schematic diagram is the latest at the time of printing and subject to change without notice.

VOLTAGE CHART - A, CRT, Z BOARDS

INTEGRATED CIRCUITS (ICs)

A BOARD

IC010

1	0	15	5	29	NC
2	2.5	16	5	30	4.8
3	4.5	17	.2	31	4.6
4	4.8	18	5	32	1
5	NC	19	5	33	0
6	5.1	20	4.5	34	0
7	0	21	.2	35	4.8
8	5	22	.05	36	0
9	.07	23	.05	37	2.6
10	5	24	.05	38	2.5
11	1.3	25	5	39	5
12	5	26	.7	40	5
13	1.2	27	.2	41	5
14	5	28	.1	42	0

IC101

1	NC	15	4.7
2	4.8	16	4.7
3	4.8	17	7.7
4	11.8	18	7.7
5	4.3	19	8.3
6	5	20	NC
7	5.3	21	NC
8	4.2	22	2.1
9	3.6	23	2.1
10	7	24	2.1
11	.07	25	0
12	11.8	26	5
13	2.5	27	3.1
14	NC	28	3.1

IC301

1	0	19	1
2	4	20	0
3	6.3	21	.8
4	NC	22	0
5	3.1	23	9.2
6	.07	24	7.3
7	4.5	25	7.3
8	5.2	26	7.2
9	.05	27	0
10	6.2	28	NC
11	8.2	29	7.6
12	4.5	30	7.6
13	4.3	31	9.1
14	6	32	7.3
15	2.5	33	0
16	8.7	34	3.5
17	2.6	35	11.8
18	6.4	36	9.4
37	4.3		
38	4.3		
39	10.5		
40	4.2		
41	7.3		
42	6.1		
43	5.6		
44	2.7		
45	5.2		
46	2.3		
47	1.8		
48	0		
49	4.2		
50	NC		
51	2.1		
52	4.2		

IC451

1	0
2	13.5
3	26.6
4	1
5	.05
6	1.6
7	25.8

IC551

1	16.4
2	0
3	12

IC801

1	0
2	132.2
3	160.8
4	131.1
5	0

TRANSISTORS

A BOARD

Ref.No.	b	c	e
Q0016	4.9	5.7	5.7
Q017	5.7	13.8	5
Q022	0	.8	0
Q023	0	25.3	0
Q024	.7	0	0
Q028	0	4.4	0
Q029	0	4.8	0
Q101	2.9	6.3	2.1
Q174	6.8	5.2	7.4
Q175	3.4	11.8	2.8
Q301	5.2	0	5.9
Q302	5.8	11.9	5.2
Q311	3.3	0	3.7
Q312	4.2	11.8	3.7
Q313	3.8	6.4	3.7
Q314	2.7	9.9	2
Q315	9.8	12	9.2
Q451	.6	0	0
Q501	0	93.5	0
Q531	5.9	0	4.6
Q534	5.4	12	6
Q551	0	137.2	0

CRT BOARD

Ref.No.	b	c	e
Q351	7.2	193.3	6.8
Q352	7.2	197.4	6.8
Q353	7.2	186.5	6.8

Z BOARD

Ref.No.	b	c	e
Q751	2.6	9.1	2
Q752	11.3	.6	11.8
Q753	.6	17.1	0

TUNER VOLTAGE CHART

Voltages taken on A-Board UV/Tuner terminals Test Point designated on the circuit side of board.

	BAND 1		BAND 2		BAND 3		BAND 4 CABLE		BAND 4 UHF	
CHAN.	2	6	95	13	23	64	65	94	14	69
30V(TPA6)	4.1V	12.8V	3.6V	25.2V	.6V	25V	4.2V	12V	4.2V	4.2V

NOTE: Voltage taken with AFC switch off. TV/CABLE Switch in TV position for UHF Band and CABLE STD (1) position for CABLE Bands 1, 2, 3, & 4. TPA6 is a supply voltage for Band Tuning (BT). The readings in the chart are to be used as references for BT voltage that changes with different bands and channels.

BP (TPA7) 5V BM (TPA8) 12V AGC (TP15) 4.1V~8V

ENABLE (TPA3), DATA (TPA4) & CLOCK (TPA5) NO DC READING, THEY ARE DIGITAL SIGNALS FROM MPU.

MICROPROCESSOR PROGRAMMING FOR BAND TUNING/SWITCHING

	FIRST TUNING BAND	SECOND TUNING BAND	THIRD TUNING BAND	FOURTH TUNING BAND
FREQ MHz	52 — 90	214 — 466		806
	TV: 2-6	TV: 7-13	CABLE ONLY 23-64	TV: 14-69
	CABLE 1-6	CABLE 95-99 14-22 7-13		CABLE 65-94
	VHF TUNER			UHF TUNER

NOTE: CABLE channel numbers as recommended by the joint EIA/NCTA Engineering Committee and published as EIA INTERIM STANDARD NO.6 — CABLE TELEVISION CHANNEL IDENTIFICATION PLAN — MAY 1983.

IMPORTANT SAFETY NOTICE

THE BOXED AREA ON THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURERS SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE BOXED AREAS OF THE SCHEMATIC.

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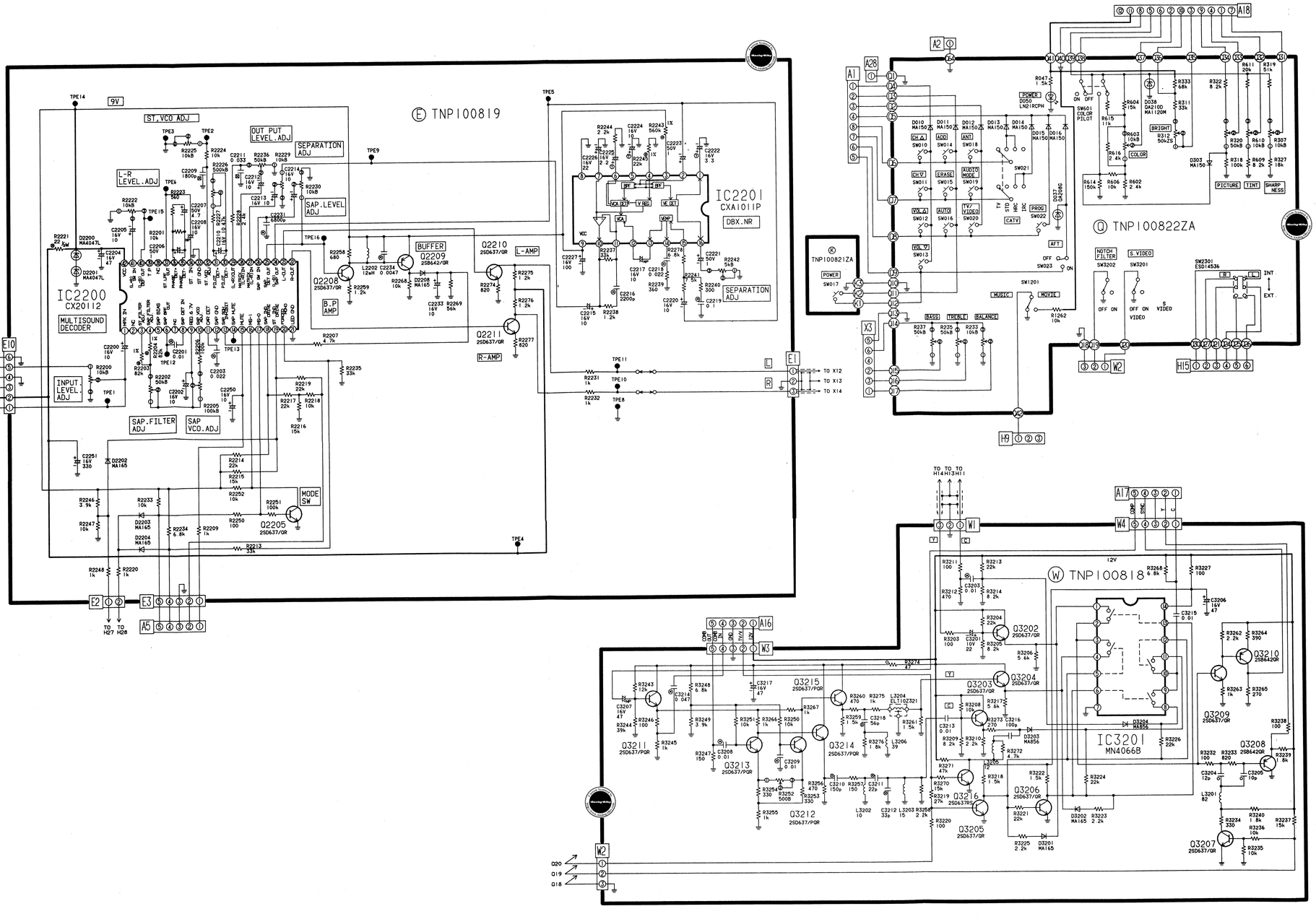
E-STEREO/SAP, Q-CONTROLS/KEYBOARD, W-COMB FILTER/S-VIDEO SWITCHING SCHEMATIC DIAGRAM



VOLTAGE CHART - E & W BOARDS

INTEGRATED CIRCUITS (ICs)

E BOARD

IC2200			
1	4.5	22	3.7
2	NC	23	3.7
3	1.5	24	3.7
4	1.5	25	3.4
5	NC	26	5.2
6	3.2	27	4.4
7	NC	28	5.1
8	2.1	29	3.5
9	6.7	30	6.9
10	.5	31	6.9
11	2.9	32	2.9
12	0	33	0
13	0	34	2.9
14	0	35	7.4
15	0	36	7.4
16	5.9	37	3.3
17	0	38	NC
18	6.7	39	NC
19	7.8	40	3.7
20	0	41	5.1
21	0	42	9.7

IC2201	
1.	1.6
2	4.7
3	2.6
4	1.2
5	1.6
6	4.4
7	4.9
8	0
9	9.7
10	4.9
11	4.9
12	4.9
13	4.9
14	0
15	4.9
16	4.8

W BOARD

IC3201	
1	5.9
2	1.9
3	1.9
4	1.9
5	8.8
6	0
7	0
8	8.8
9	4.1
10	4.1
11	0
12	8.8
13	1.5
14	10.9

TRANSISTORS

E BOARD

Ref.No.	b	c	e
Q2205	1.1	5.7	0
Q2208	3.4	0	2.6
Q2209	9.6	0	9.7
Q2210	3.7	7.2	3.2
Q2211	3.7	7.2	3.7

W BOARD

Ref.No.	b	c	e
Q3202	3.2	11.8	5.8
Q3203	3.2	11.8	2.6
Q3204	2.8	11.8	2.2
Q3205	0	8.7	0
Q3206	.7	0	0
Q3207	0	0	0
Q3208	2.2	0	2.9
Q3209	2.2	8.2	1.6
Q3210	8.2	2.9	8.8
Q3211	7.8	10.8	7.2
Q3212	3.1	6.4	2.3
Q3213	3.1	6.4	2.3
Q3214	6.4	10.7	5.8
Q3215	6.4	10.7	5.8
Q3216	0	11.7	0

VOLTAGE CHART - X & V BOARDS

INTEGRATED CIRCUITS (ICs)

X BOARD

	IC3002		IC2101	IC2301
	TV	VID		
1	3.5	3.5	1 3.5	1 19.3
2	11.9	11.8	2 10.2	2 9.8
3	4.2	4.2	3 6.9	3 0
4	.4	4.4	4 3.2	4 0
5	4.2	4.2	5 3.1	5 1.2
6	.4	4.4	6 3.3	6 18.4
7	0	0	7 0	7 18.3
8	3.5	3.5	8 3.2	8 10.2
9	4.6	4.2	9 3.3	9 0
10	4.2	4.1	10 7.1	10 0
11	4.9	4.9	11 3.3	11 9.8
12	5.7	5.6	12 0	12 19.2
13	.4	4.3		
14	NC	NC		
15	4.3	4.2		
16	4.1	4.2		

TRANSISTORS

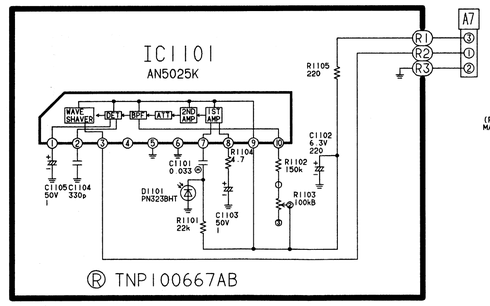
X BOARD

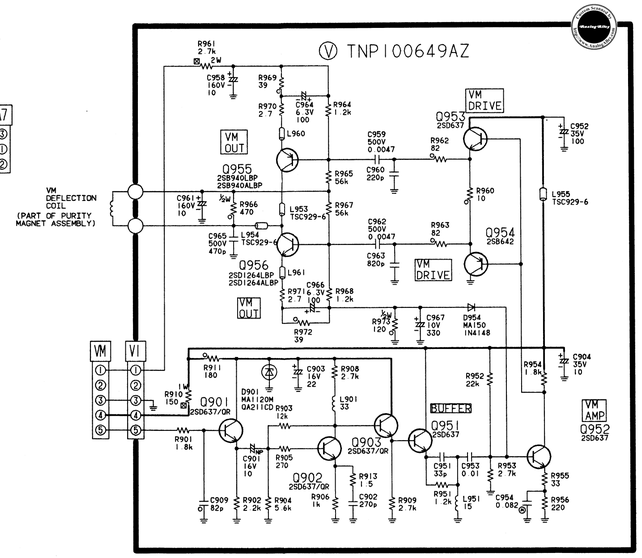
Ref.No.	b	c	e
Q2140	0	11.1	0
Q2142	0	.3	0
Q2401	11.8	19.2	11.2
Q3001	3.4	11.1	2.8
Q3014	3.1	10.6	2.4
Q3015	2.6	10.1	2.4
Q3101	3.1	6.4	2.4
Q3102	3.1	6.3	2.5
Q3103	7.1	3.1	7.7
Q3104	7.1	3.1	7.6

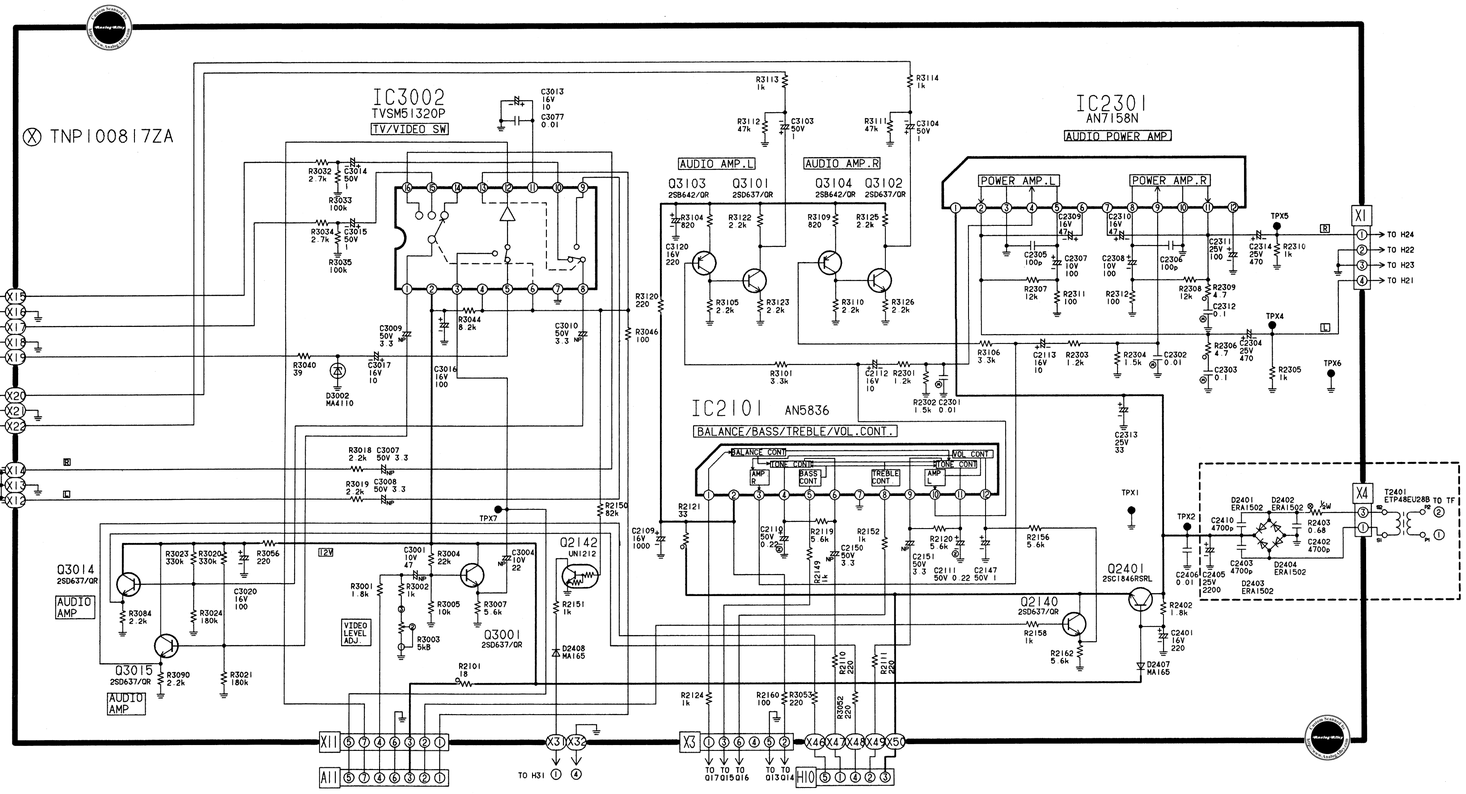
V BOARD

Ref.No.	b	c	e
Q901	1.8	12.8	1.2
Q902	1.6	3.5	2.3
Q903	7.2	12.8	6.6
Q951	6.6	18.5	6.0
Q952	1.9	9.8	1.3
Q953	9.8	18.5	9.8
Q954	9.8	0	9.8
Q955	120	61.2	120.7
Q956	3.1	61.5	2.6

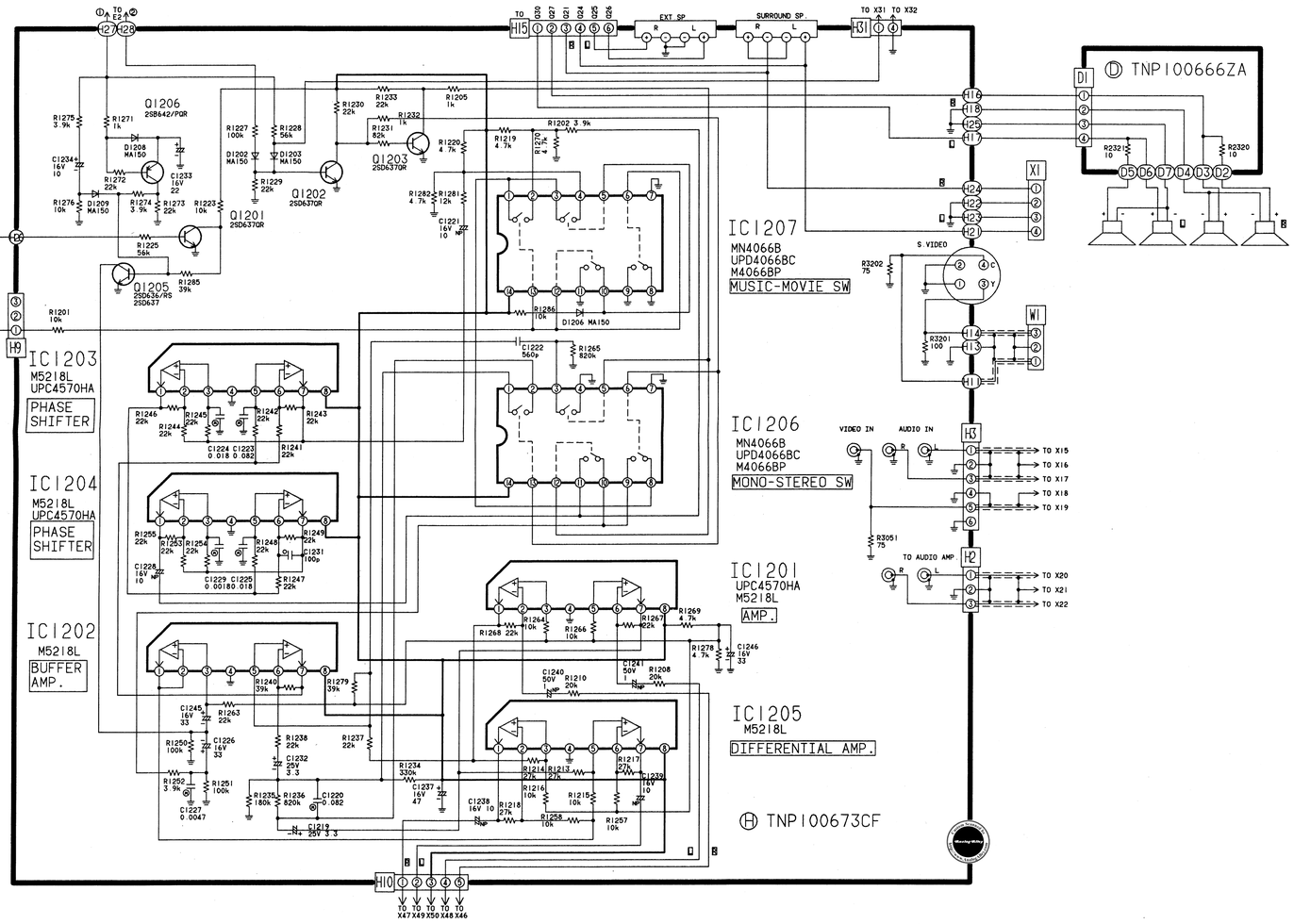
X-AUDIO/VIDEO SWITCHING, R-REMOTE RECEIVER, V-VELOCITY MODULATOR SCHEMATIC DIAGRAM







H-SURROUND SOUND, D-SPEAKER CONNECTOR SCHEMATIC DIAGRAM



VOLTAGE CHART - H BOARD

INTEGRATED CIRCUITS (ICs)

	IC1201		IC1202		IC1203		IC1204		IC1205		IC1206		IC1207	
1.	5.5	1	5.5	1	5.5	1	5.5	1	5.5	1	3.9	1	5.5
2	5.5	2	5.5	2	5.5	2	5.5	2	5.5	2	3.9	2	5.5
3	5.5	3	5.5	3	5.5	3	5.5	3	5.5	3	0	3	5.5
4	0	4	0	4	0	4	0	4	0	4	0	4	4.5
5	5.5	5	5.5	5	5.5	5	5.5	5	5.5	5	0	5	0
6	5.5	6	5.5	6	5.5	6	5.5	6	5.5	6	8.9	6	12
7	5.5	7	5.5	7	5.5	7	5.5	7	5.5	7	0	7	0
8	12	8	12	8	12	8	12	8	12	8	5.5	8	0
										9	5.5	9	0
										10	5.5	10	0
										11	5.5	11	0
										12	0	12	12
										13	8.9	13	12
										14	12	14	11.2

TRANSISTORS

Ref.No.	b	c	e
Q1201	.6	0	0
Q1202	0	8.9	0
Q1203	.6	0	0
Q1205	0	0	0
Q1206	.7	0	.9

REPLACEMENT PARTS LIST

Important Safety Notice: Components identified by shaded area have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

Ref. No.	Part No.	Description
CAPRISTORS		
CRA801	**EXNG131P155**	**RES-CAP 130PF/1.5ME**
CRA802	**EXNG131P155**	**RES-CAP 130PF/1.5ME**
CAPACITORS		
C018	ECKF1H103ZF	CAP,C .01UF-Z-50V
C019	ECKF1H103ZF	CAP,C .01UF-Z-50V
C020	ECKF1H821KB	CAP,C 820PF-K-50V
C021	ECKF1H821KB	CAP,C 820PF-K-50V
C022	ECKF1H821KB	CAP,C 820PF-K-50V
C023	ECKF1H821KB	CAP,C 820PF-K-50V
C024	ECCF1H100DP	CAP,C 10PF-D-50V
C025	ECCF1H390JP	CAP,C 39PF-J-50V
C026	ECCF1H101KW	CAP,C 100PF-K-50V
C027	ECKF1H391KB	CAP,C 390PF-K-50V
C028	ECEA1HU010	CAP,E 1UF/50V
C029	ECKF1H181KB	CAP,C 180PF-K-50V
C030	ECKF1H181KB	CAP,C 180PF-K-50V
C031	ECKF1H121KB	CAP,C 120PF-K-50V
C032	ECEA1HU4R7	CAP,E 4.7UF/50V
C033	ECKF1H103ZF	CAP,C .01UF-Z-50V
C035	ECEA0JU101	CAP,E 100UF/6.3V
C036	**ECRHA030E41**	**TRIMMER: 30PF**
C037	ECEA1CU220	CAP,E 22UF/16V
C040	ECEA1CU102	CAP,E 1000UF/16V
C041	ECEA1CU100	CAP,E 10UF/16V
C042	ECKF1H561KB	CAP,C 560PF-K-50V
C043	ECEA0JU222	CAP,E 2200UF/6.3V
C046	ECEA1HU010	CAP,E 1UF/50V
C047	ECKF1H103ZF	CAP,C .01UF-Z-50V
C048	ECEA1CU100	CAP,E 10UF/16V
C049	ECKF1H103ZF	CAP,C .01UF-Z-50V
C050	ECEA0JU101	CAP,E 100UF/6.3V
C053	ECCF1H820K	CAP,C 82PF-K-50V
C054	ECKF1H821KB	CAP,C 820PF-K-50V
C055	ECKF1H821KB	CAP,C 820PF-K-50V
C056	ECKF1H821KB	CAP,C 820PF-K-50V
C057	ECKF1H821KB	CAP,C 820PF-K-50V
C058	ECKF1H821KB	CAP,C 820PF-K-50V
C059	ECEA0JU330	CAP,E 33UF/6.3V
C060	TCBL1E103NR	CAP,C .01UF-N-25V
C061	ECCF1H330K	CAP,C 33PF-K-50V
C062	ECCF1H560K	CAP,C 56PF-J-50V
C065	ECRHA050G41	TRIMMER: 50PF
C101	ECKF1H103ZF	CAP,C .01UF-Z-50V
C102	ECKF1H103ZF	CAP,C .01UF-Z-50V
C103	ECKF1H103ZF	CAP,C .01UF-Z-50V
C104	ECKF1H103ZF	CAP,C .01UF-Z-50V
C105	ECQM1H224KV	CAP,P .22UF-K-50V
C106	ECEA1CU100	CAP,E 10UF/16V
C107	ECEA1CU220	CAP,E 22UF/16V
C108	ECEA1HU010	CAP,E 1UF/50V
C109	ECEA50ZR47	CAP,E .47UF/50V
C111	ECKF1H103ZF	CAP,C .01UF-Z-50V
C113	ECKF1H103ZF	CAP,C .01UF-Z-50V
C114	ECCF1H060CC	CAP,C 6PF-C-50V
C115	ECCF1H030CC	CAP,C 3PF-C-50V
C151	ECCF1H560JL	CAP,C 56PF-J-50V
C152	ECCF1H120JC	CAP,C 12PF-J-50V
C154	ECKF1H103ZF	CAP,C .01UF-Z-50V
C201	ECCF1H080D	CAP,C 8PF-D-50V
C202	ECCF1H820KP	CAP,C 82PF-K-50V
C203	ECQM1H473KV	CAP,P .047UF-K-50V
C204	ECKF1H103ZF	CAP,C .01UF-Z-50V
C206	ECCF1H390KP	CAP,C 39PF-K-50V
C209	ECEA1CN100S	CAP,E 10UF/16V
C302	ECEA1CU102	CAP,E 1000UF/16V
C303	ECEA1HU2R2	CAP,E 2.2UF/50V
C305	ECQM1H683KV	CAP,P .068UF-K-50V
C308	ECEA1HU010	CAP,E 1UF/50V
C309	ECEA1EN4R7S	CAP,E 4.7UF/25V
C312	ECEA1HU010	CAP,E 1UF/50V
C313	ECEA1EU4R7	CAP,E 4.7UF/25V
C314	ECEA1CU100	CAP,E 10UF/16V
C315	ECQM1H153KV	CAP,P .015UF-K-50V
C319	ECEA1HU010	CAP,E 1UF/50V
C326	ECEA1HU010	CAP,E 1UF/50V
C332	ECEA1CU220	CAP,E 22UF/16V
C333	ECEA1HU010	CAP,E 1UF/50V
C334	ECEA1HU010	CAP,E 1UF/50V
C351	ECKF1H391KB	CAP,C 390PF-K-50V
C352	ECKF1H391KB	CAP,C 390PF-K-50V
C353	ECKF1H471KB	CAP,C 470PF-K-50V
C354	ECKD3D102KB	CAP,C .001UF-K-2KV
C355	ECEA1HU100	CAP,E 10UF/50V
C359	ECKD3A102KB	CAP,C .001UF-K-1KV
C360	ECKF1H331KB	CAP,C 330PF-K-50V
C365	ECEA1CU102	CAP,E 1000UF/16V
C366	ECEA1CU221	CAP,E 220UF/16V
C367	ECCF1H560K	CAP,C 56PF-J-50V
C368	ECCF1H270K	CAP,C 27PF-K-50V
C401	ECSZ25EF2R2N	CAP,T 2.2UF/25V
C402	ECEA1HN010S	CAP,E 1UF/50V
C403	ECQM1H123KV	CAP,P .012UF-K-50V
C404	ECEA16Z10K	CAP,E 10UF/16V
C405	ECEA50Z1K	CAP,E 1UF/50V
C406	ECQM1H123KV	CAP,P .012UF-K-50V
C407	ECEA25Z4R7K	CAP,E 4.7UF/25V
C408	ECQM1H103KV	CAP,P .01UF-K-50V
C421	ECKF1H103ZF	CAP,C .01UF-Z-50V
C452	ECEA1EU102	CAP,E 1000UF/25V
C453	ECQM1223KZ	CAP,P .022UF-K-100V
C455	ECEA1HU101	CAP,E 100UF/50V
C456	ECKD2H391KB	CAP,C 390PF-K-500V
C501	ECEA1CU331	CAP,E 330UF/16V
C502	**ECEA1CU101**	**CAP,E 100UF/16V**
C503	ECCF1H471JU	CAP,C 470PF-J-50V
C504	ECQM1H333KV	CAP,P .033UF-K-50V
C505	ECEA1HU010	CAP,E 1UF/50V
C506	ECQM1H822KV	CAP,P .0082UF-K-50V
C507	ECQM1H682KV	CAP,P .0068UF-K-50V
C508	ECQM1H223KV	CAP,P .022UF-K-50V
C509	ECKF1H221KB	CAP,C 220PF-K-50V
C510	ECCD2H220K	CAP,C 22PF-K-500V
C511	ECKD2H681KB	CAP,C 680PF-K-500V
C512	ECCF1H680J	CAP,C 68PF-J-50V
C513	ECKD2H101KB	CAP,C 100PF-K-500V
C531	**ECEA35Z47**	**CAP,E 47UF/35V**
C532	**ECKF1H103ZF**	**CAP,C .01UF-Z-50V**
C551	**ECQM2562JZ**	**CAP,P .0056UF-J-200V**
C552	**ECWH12H103JS**	**CAP,P .01UF-J-1.2KV**
C553	ECKF1H103ZF	CAP,C .01UF-Z-50V
C554	TCBL1E103NR	CAP,C .01UF-N-25V
C556	**ECKD3D391JB**	**CAP,C 390PF-J-2KV**
C557	ECKDHT561KB	CAP,C 560PF-K-500V
C558	**ECEA1EU471**	**CAP,E 470UF/25V**
C561	**ECQF2H504JS**	**CAP,P .5UF-J-200V**
C562	**ECEA1VGE471**	**CAP,E 470UF/35V**
C563	ECKDHT561KB	CAP,C 560PF-K-500V
C564	**ECEA2EG330**	**CAP,E 33UF/250V**
C565	**ECEA160N1**	**CAP,E 1UF/160V**
C566	**ECKD3D181JB**	**CAP,C 180PF-J-2KV**
C567	**ECKD3D821JB**	**CAP,C 820PF-J-2KV**
C568	ECKD2H102KB	CAP,C .001UF-K-500V
C570	**ECQM2473JZ**	**CAP,P .047UF-J-200V**
C577	**ECEA160V33Z**	**CAP,E 33UF/160V**
C580	**ECWH12H332JS**	**CAP,P .0033UF-J-1.2KV**
C581	**ECKD3D471JB**	**CAP,C 470PF-J-2KV**
C583	ECKF1H272KB	CAP,C .0027UF-K-50V
C584	ECQM1H473KV	CAP,P .047UF-K-50V
C601	ECCF1H080DU	CAP,C 8PF-D-50V
C605	ECQM1H103KV	CAP,P .01UF-K-50V
C607	ECEA1HU3R3	CAP,E 3.3UF/50V
C608	ECEA1HU3R3	CAP,E 3.3UF/50V
C609	ECEA1HUR47	CAP,E .47UF/50V
C613	ECCF1H101JC	CAP,C 100PF-J-50V
C614	ECKF1H103ZF	CAP,C .01UF-Z-50V
C615	ECCF1H150JC	CAP,C 15PF-J-50V
C616	ECKF1H101KB	CAP,C 100PF-K-50V
C617	ECKF1H101KB	CAP,C 100PF-K-50V
C618	ECKF1H101KB	CAP,C 100PF-K-50V
C751	ECQM1H102KV	CAP,P .001UF-K-50V
C752	ECEA1HU101	CAP,E 100UF/50V
C753	ECSZ16EF22	CAP,T 22UF/16V
C754	ECQM1H104KV	CAP,P .1UF-K-50V
C755	ECQM1H104KV	CAP,P .1UF-K-50V
C756	ECEA0JU221	CAP,E 220UF/6.3V
C757	ECEA1VU470	CAP,E 47UF/35V
C759	ECQE1395KN	CAP,P .068UF-K-100V
C760	ECEA1VU101	CAP,E 100UF/35V

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REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
C761	ECEA1VU100	CAP,E 10UF/35V
C773	**ECKD3D561JB**	**CAP,C 560PF-J-2KV**
C801	**ECQU1A473KH**	**CAP,P .047UF-K-125VAC**
C802	**ECKDAE103ZVD**	**CAP,C .01UF-Z-250VAC**
C803	**ECKDAE103ZVD**	**CAP,C .01UF-Z-250VAC**
C804	**ECKDAE103ZVD**	**CAP,C .01UF-Z-250VAC**
C805	**ECES2DU471M**	**CAP,E 470UF/500V**
C806	**ECEA2CS220**	**CAP,E 22UF/160V**
C812	**ECKDAE103ZVD**	**CAP,C .01UF-Z-250VAC**
C821	**ECQU1A153KH**	**CAP,P .015UF-K-125VAC**
C822	**ECQU1A153KH**	**CAP,P .015UF-K-125VAC**
C824	**ECKCFL222ZE**	**CAP,C .0022UF-Z-125VAC**
C901	ECEA1CN100S	CAP,E 10UF/16V
C902	ECCF1H271K	CAP,C 270PF-K-50V
C903	ECEA1CU220	CAP,E 22UF/16V
C904	ECEA1VU100	CAP,E 10UF/35V
C909	ECCF1H820K	CAP,C 82PF-K-50V
C951	ECCF1H330JR	CAP,C 33PF-J-50V
C952	ECEA1VU101	CAP,E 100UF/35V
C953	ECKF1H103MD	CAP,C .01UF-M-50V
C954	ECQM1H823MV	CAP,P .082UF-M-50V
C958	ECEA2CS100	CAP,E 10UF/160V
C959	ECKD2H472MD	CAP,C .0047UF-M-500V
C960	ECCF1H221K	CAP,C 220PF-K-50V
C961	ECEA2CS100	CAP,E 10UF/160V
C962	ECKD2H472MD	CAP,C .0047UF-M-500V
C963	ECKF1H821KB	CAP,C 820PF-K-50V
C964	ECEA0JU101	CAP,E 100UF/6.3V
C965	ECKD2H471KB	CAP,C 470PF-K-500V
C966	ECEA0JU101	CAP,E 100UF/6.3V
C967	ECEA1AU331	CAP,E 330UF/10V
C2109	ECEA1CU102	CAP,E 1000UF/16V
C2110	ECEA50ZR22	CAP,E .22UF/50V
C2111	ECEA50ZR22	CAP,E .22UF/50V
C2112	ECEA1CU100	CAP,E 10UF/16V
C2113	ECEA1CU100	CAP,E 10UF/16V
C2147	ECEA1HU010	CAP,E 1UF/50V
C2150	ECEA1HN3R3S	CAP,E 3.3UF/50V
C2151	ECEA1HN3R3S	CAP,E 3.3UF/50V
C2200	ECEA1CU100	CAP,E 10UF/16V
C2201	ECQM1H103KV	CAP,P .01UF-K-50V
C2202	ECEA1CU100	CAP,E 10UF/16V
C2203	ECQM1H223JV	CAP,P .022UF-J-50V
C2204	ECEA1CU470	CAP,E 47UF/16V
C2205	ECEA1CU100	CAP,E 10UF/16V
C2206	ECEA1HU010	CAP,E 1UF/50V
C2207	ECEA1HU4R7	CAP,E 4.7UF/50V
C2208	ECEA1CN100S	CAP,E 10UF/16V
C2209	ECQP1H182JZ	CAP,P .0018UF-J-50V
C2210	ECEA1CU100	CAP,E 10UF/16V
C2211	ECQP1H333JZ	CAP,P .033UF-J-50V
C2212	ECEA1CU100	CAP,E 10UF/16V
C2213	ECEA1CU100	CAP,E 10UF/16V
C2214	ECEA1CU100	CAP,E 10UF/16V
C2215	ECEA1CU100	CAP,E 10UF/16V
C2216	ECQM1H222JV	CAP,P .0022UF-J-50V
C2217	ECEA1CN100S	CAP,E 10UF/16V
C2218	ECQM1H223JV	CAP,P .022UF-J-50V
C2219	ECQM1H104JV	CAP,P .1UF-J-50V
C2220	ECEA1CU100	CAP,E 10UF/16V
C2221	ECEA1HU010	CAP,E 1UF/50V
C2222	ECSZ16EF3R3	CAP,T 3.3UF/16V
C2223	ECEA1HU010	CAP,E 1UF/50V
C2224	ECSZ16EF10	CAP,T 10UF/16V
C2225	ECSZ16EF2R2	CAP,T 2.2UF/16V
C2226	ECEA1CU220	CAP,E 22UF/16V
C2227	ECEA1CU101	CAP,E 100UF/16V
C2231	ECQM1H682KV	CAP,P .0068UF-K-50V
C2233	ECEA1CU100	CAP,E 10UF/16V
C2234	ECQM1H472KV	CAP,P .0047UF-K-50V
C2250	ECEA1CU100	CAP,E 10UF/16V
C2251	ECEA1CU331	CAP,E 330UF/16V
C2301	ECQM1H103KV	CAP,P .01UF-K-50V
C2302	ECQM1H103KV	CAP,P .01UF-K-50V
C2303	ECQM1H104JV	CAP,P .1UF-J-50V
C2304	ECEA1EU471	CAP,E 470UF/25V
C2305	ECKF1H101KB	CAP,C 100PF-K-50V
C2306	ECKF1H101KB	CAP,C 100PF-K-50V
C2307	ECEA1AU101	CAP,E 100UF/10V
C2308	ECEA1AU101	CAP,E 100UF/10V
C2309	ECEA1CU470	CAP,E 47UF/16V
C2310	ECEA1CU470	CAP,E 47UF/16V
C2311	ECEA1EU101	CAP,E 100UF/25V
C2312	ECQM1H104JV	CAP,P .1UF-J-50V
C2313	ECEA1EU330	CAP,E 33UF/25V
C2314	ECEA1EU471	CAP,E 470UF/25V
C2401	ECEA1CU221	CAP,E 220UF/16V
C2402	**ECKF1H472KB**	**CAP,C .0047UF-K-50V**
C2403	**ECKF1H472KB**	**CAP,C .0047UF-K-50V**
C2405	**ECEA1EU222**	**CAP,E 2200UF/25V**
C2406	ECKF1H103ZF	CAP,C .01UF-Z-50V
C2410	**ECKF1H472KB**	**CAP,C .0047UF-K-50V**
C3001	ECEA1AN470S	CAP,E 47UF/10V
C3004	ECEA1AN220S	CAP,E 22UF/10V
C3007	ECEA1HN3R3S	CAP,E 3.3UF/50V
C3008	ECEA1HN3R3S	CAP,E 3.3UF/50V
C3009	ECEA1HN3R3S	CAP,E 3.3UF/50V
C3010	ECEA1HN3R3S	CAP,E 3.3UF/50V
C3013	ECEA1CU100	CAP,E 10UF/16V
C3014	ECEA1HU010	CAP,E 1UF/50V
C3015	ECEA1HU010	CAP,E 1UF/50V
C3016	ECEA1CU101	CAP,E 100UF/16V
C3017	ECEA1CU100	CAP,E 10UF/16V
C3020	ECEA1CU101	CAP,E 100UF/16V
C3077	ECKF1H103ZF	CAP,C .01UF-Z-50V
C3103	ECEA1HU010	CAP,E 1UF/50V
C3104	ECEA1HU010	CAP,E 1UF/50V
C3120	ECEA1CU221	CAP,E 220UF/16V
C3201	ECEA1AU220	CAP,E 22UF/10V
C3203	ECQM1H103KV	CAP,P .01UF-K-50V
C3204	ECCF1H120K	CAP,C 12PF-K-50V
C3205	ECCF1H100F	CAP,C 10PF-F-50V
C3206	ECEA1CU470	CAP,E 47UF/16V
C3207	ECEA1CN470S	CAP,E 47UF/16V
C3208	ECQM1H103KV	CAP,P .01UF-K-50V
C3209	ECQM1H103KV	CAP,P .01UF-K-50V
C3210	ECCF1H151JC	CAP,C 150PF-J-50V
C3211	ECCF1H220JC	CAP,C 22PF-J-50V
C3212	ECCF1H330JC	CAP,C 33PF-J-50V
C3213	ECKF1H103ZF	CAP,C .01UF-Z-50V
C3214	ECQM1H473KV	CAP,P .047UF-K-50V
C3215	ECKF1H103ZF	CAP,C .01UF-Z-50V
C3216	ECCF1H101JC	CAP,C 100PF-J-50V
C3217	ECEA1CU470	CAP,E 47UF/16V
C3218	ECCF1H560JC	CAP,C 56PF-J-50V
DIODES		
D010	MA150	DIODE
D011	MA150	DIODE
D012	MA150	DIODE
D013	MA150	DIODE
D014	MA150	DIODE
D015	MA150	DIODE
D016	MA150	DIODE
D018	MA165	DIODE
D019	MA165	DIODE
D020	MA165	DIODE
D021	MA165	DIODE
D023	EQA0313B	DIODE, ZENER
D025	MA165	DIODE
D026	MA161	DIODE
D030	TVSQA205E	DIODE, ZENER
D031	ERA1501	DIODE
D032	MA162	DIODE
D035	MA165	DIODE
D037	TVSQA208G	DIODE, ZENER
D038	MA1120M	DIODE, ZENER
D039	MA27TB	DIODE
D050	LN21RCPH	DIODE LED
D068	MA165	DIODE
D070	MA165	DIODE
D101	TVSQA207M3	DIODE, ZENER
D303	MA150	DIODE
D307	MA165	DIODE
D309	MA165	DIODE
D311	MA165	DIODE
D451	ERA1501	DIODE
D452	MA165	DIODE
D453	MA165	DIODE
D503	MA165	DIODE
D506	MA165	DIODE

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REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
D507	MA4062H	DIODE, ZENER
D531	**AS01**	**DIODE**
D533	**TVSQA206M**	**DIODE, ZENER**
D534	MA165	DIODE
D552	**TVSRU2AM**	**DIODE**
D553	**AU02V0**	**DIODE**
D554	**AU01V0**	**DIODE**
D555	MA150	DIODE
D556	**TVSQA205C**	**DIODE, ZENER**
D558	MA165	DIODE
D560	**TVSRU2AM**	**DIODE**
D561	**ERC0615**	**DIODE**
D603	MA165	DIODE
D751	MA150	DIODE
D752	TVSQA228B	DIODE, ZENER
D753	MA1300M	DIODE, ZENER
D801	**ERC1208**	**DIODE**
D802	**ERC1208**	**DIODE**
D803	**ERC1208**	**DIODE**
D804	**ERC1208**	**DIODE**
D805	**TRPW5B0M050A**	**THERMISTOR**
D901	MA1120M	DIODE, ZENER
D954	MA150	DIODE
D2200	MA4047L	DIODE
D2201	MA4047L	DIODE
D2202	MA165	DIODE
D2203	MA165	DIODE
D2204	MA165	DIODE
D2208	MA165	DIODE
D2401	**ERA1502**	**DIODE**
D2402	**ERA1502**	**DIODE**
D2403	**ERA1502**	**DIODE**
D2404	**ERA1502**	**DIODE**
D2407	MA165	DIODE
D2408	MA165	DIODE
D3002	MA4110	DIODE
D3201	MA165	DIODE
D3202	MA165	DIODE
D3203	MA856	DIODE
D3204	MA856	DIODE
FUSES		
F001	**XBA1F40NU100**	**FUSE 4.0A/125V**
F002	**XBA1C15NU100**	**FUSE 1.5A/125V**
INTEGRATED CIRCUITS		
IC010	MN15247Q10	PHASE 10
IC101	AN5136KR	INT CKT
IC301	**AN5301NK**	**INT CKT**
IC451	AN5521	INT CKT
IC551	**AN78M12**	**PLUS 12V AVR**
IC801	**STR3230**	**INT CKT**
IC2101	AN5836	BAL, TONE, VOLUME CONTROL
IC2200	CX20112	INT CKT
IC2201	CXA1011P	INT CKT
IC2301	AN7158N	DUAL AUDIO POWER AMP
IC3002	M51320P	TV/VIDEO SW
IC3201	MN4066B	INT CKT
COILS		
L020	ELEPH220KA	COIL, PEAKING 22UH
L021	ELEPH680KA	COIL, PEAKING 68UH
L024	TSC925-4	FERRITE BEAD
L025	ELEPH4R7KA	COIL, PEAKING 4.7UH
L027	ELEPH390KA	COIL, PEAKING 39UH
L028	ELEPH220KA	COIL, PEAKING 22UH
L101	TLQR47N205C	COIL, PEAKING .47UH
L104	TLI158755	COIL, VC0
L105	ELEPH3R3KA	COIL, PEAKING 3.3UH
L106	ELEPH150KA	COIL, PEAKING 15UH
L107	ELEPH4R7KA	COIL, PEAKING 4.7UH
L109	ELEPH1R0KA	COIL, PEAKING 1.0UH
L112	TLQ010K205C	COIL, PEAKING 1.0UH
L152	TLI67394-1	COIL, AFT
L201	EIS1EG011B	COIL, QUADRATURE
L303	EFDBN645B95G	1H DELAY LINE
L304	TLK153152	COMB FILTER
L351	ELEPH151KA	COIL, PEAKING 150UH

Ref. No.	Part No.	Description
L553	**TLH6618P**	**COIL, LINEARITY**
L554	TSC925-4	FERRITE BEAD
L555	TSC925-4	FERRITE BEAD
L557	**TSC911**	**FERRITE BEAD**
L558	TSC925-4	FERRITE BEAD
L559	**TSC909**	**FERRITE BEAD**
L561	**TLY15440F**	**YOKE, DEFLECTION**
L564	**TSC910**	**FERRITE BEAD**
L565	**TSC910**	**FERRITE BEAD**
L601	ELEPH820KA	COIL, PEAKING 82UH
L751	**TLH15727**	**REACTOR, PINCUSHION**
L801	**ELF18D650A**	**LINE FILTER**
L805	**TLK259073**	**COIL, DEGAUSSING**
L901	ELEPH330KA	COIL, PEAKING 33UH
L951	ELEPH150KA	COIL, PEAKING 15UH
L953	TSC929-6	FERRITE BEAD
L954	TSC929-6	FERRITE BEAD
L955	TSC929-6	FERRITE BEAD
L960	TSC932	FERRITE BEAD
L961	TSC932	FERRITE BEAD
L2202	TLX123J116	COIL, PEAKING 12MH
L3201	ELEPH820JA	COIL, PEAKING 82UH
L3202	ELEPH100JA	COIL, PEAKING 10UH
L3203	ELEPH150JA	COIL, PEAKING 15UH
L3204	ELT10Z321	DELAY LINE
L3205	ELEPH120JA	COIL, PEAKING 12UH
L3206	ELEPH390JA	COIL, PEAKING 39UH
TRANSISTORS		
Q016	2SB642PQR	TRANSISTOR
Q017	2SD637PQR	TRANSISTOR
Q022	2SD637QR	TRANSISTOR
Q023	2SD637RS	TRANSISTOR
Q024	2SD637QR	TRANSISTOR
Q028	2SD637QR	TRANSISTOR
Q029	2SD637QR	TRANSISTOR
Q101	2SC2377C	TRANSISTOR
Q174	2SB642QR	TRANSISTOR
Q175	2SD637QR	TRANSISTOR
Q301	2SB643RS	TRANSISTOR
Q302	2SD637QR	TRANSISTOR
Q311	2SB642QR	TRANSISTOR
Q312	2SD637QR	TRANSISTOR
Q313	2SD637QR	TRANSISTOR
Q314	2SD637QR	TRANSISTOR
Q315	2SD637QR	TRANSISTOR
Q351	2SC3063	TRANSISTOR
Q352	2SC3063	TRANSISTOR
Q353	2SC3063	TRANSISTOR
Q451	2SD637QR	TRANSISTOR
Q501	2SC2653HCL	TRANSISTOR
Q531	2SB642QR	TRANSISTOR
Q534	2SD637QR	TRANSISTOR
Q551	**2SD1175**	**TRANSISTOR**
Q751	2SD637PQR	TRANSISTOR
Q752	2SB642QR	TRANSISTOR
Q753	2SD1266	TRANSISTOR
Q901	2SD637QR	TRANSISTOR
Q902	2SD637QR	TRANSISTOR
Q903	2SD637QR	TRANSISTOR
Q951	2SD637	TRANSISTOR
Q952	2SD637	TRANSISTOR
Q953	2SD637	TRANSISTOR
Q954	2SB642	TRANSISTOR
Q954	2SB642Q	TRANSISTOR
Q955	2SB940P	TRANSISTOR
Q956	2SD1264P	TRANSISTOR
Q2140	2SD637QR	TRANSISTOR
Q2142	UN1212	TRANSISTOR
Q2205	2SD637QR	TRANSISTOR
Q2208	2SD637QR	TRANSISTOR
Q2209	2SB642QR	TRANSISTOR
Q2210	2SD637QR	TRANSISTOR
Q2211	2SD637QR	TRANSISTOR
Q2401	2SC1846RS	TRANSISTOR
Q3001	2SD637QR	TRANSISTOR
Q3014	2SD637QR	TRANSISTOR
Q3015	2SD637QR	TRANSISTOR
Q3101	2SD637QR	TRANSISTOR
Q3102	2SD637QR	TRANSISTOR

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Ref. No.	Part No.	Description
Q3103	2SB642QR	TRANSISTOR
Q3104	2SB642QR	TRANSISTOR
Q3202	2SD637QR	TRANSISTOR
Q3203	2SD637QR	TRANSISTOR
Q3204	2SD637QR	TRANSISTOR
Q3205	2SD637QR	TRANSISTOR
Q3206	2SD637QR	TRANSISTOR
Q3207	2SD637QR	TRANSISTOR
Q3208	2SB642QR	TRANSISTOR
Q3209	2SD637QR	TRANSISTOR
Q3210	2SB642QR	TRANSISTOR
Q3211	2SD637PQR	TRANSISTOR
Q3212	2SD637PQR	TRANSISTOR
Q3213	2SD637PQR	TRANSISTOR
Q3214	2SD637PQR	TRANSISTOR
Q3215	2SD637PQR	TRANSISTOR
Q3216	2SD637RS	TRANSISTOR
RELAYS		
RL010	**TSE1854**	**RELAY**
RESISTORS		
R010	ERDS2TJ102	RES,C 1K-J-1/4
R011	ERDS2TJ102	RES,C 1K-J-1/4
R012	ERDS2TJ102	RES,C 1K-J-1/4
R013	ERDS2TJ102	RES,C 1K-J-1/4
R014	ERDS2TJ102	RES,C 1K-J-1/4
R015	ERDS2TJ102	RES,C 1K-J-1/4
R016	ERD25TJ101	RES,C 100-J-1/4
R017	ERD25TLJ101	RES,C 100-J-1/4
R018	ERD25TJ101	RES,C 100-J-1/4
R019	ERD25TLJ121	RES,C 120-J-1/4
R020	ERDS2TJ102	RES,C 1K-J-1/4
R021	ERDS2TJ391	RES,C 390-J-1/4
R022	ERDS2TJ102	RES,C 1K-J-1/4
R024	ERD25TLJ152	RES,C 1.5K-J-1/4
R025	ERD25TLJ182	RES,C 1.8K-J-1/4
R026	ERDS2TJ122	RES,C 1.2K-J-1/4
R027	ERD25TLJ182	RES,C 1.8K-J-1/4
R028	ERD25TLJ684	RES,C 680K-J-1/4
R030	ERD25TJ104	RES,C 100K-J-1/4
R031	ERD25TLJ563	RES,C 56K-J-1/4
R032	ERD25TLJ331	RES,C 330-J-1/4
R033	ERD25TJ564	RES,C 560K-J-1/4
R037	ERD25TLJ822	RES,C 8.2K-J-1/4
R038	ERD25TJ822	RES,C 8.2K-J-1/4
R039	ERG1ANJ683	RES,M 68K-J-1W
R043	ERDS2TJ101	RES,C 100-J-1/4
R044	ERDS2TJ101	RES,C 100-J-1/4
R045	ERD25TJ101	RES,C 100-J-1/4
R046	ERD25TLJ102	RES,C 1K-J-1/4
R047	ERD25TJ152	RES,C 1.5K-J-1/4
R048	ERD25TLJ101	RES,C 100-J-1/4
R049	ERD25FJ680	RES,C 68-J-1/4
R050	ERDS2TJ682	RES,C 6.8K-J-1/4
R051	ERD25TLJ103	RES,C 10K-J-1/4
R052	ERD25TLJ103	RES,C 10K-J-1/4
R053	ERD25TJ122	RES,C 1.2K-J-1/4
R054	ERD25TLJ562	RES,C 5.6K-J-1/4
R055	ERD25TJ562	RES,C 5.6K-J-1/4
R056	ERDS2TJ103	RES,C 10K-J-1/4
R057	ERD25TLJ153	RES,C 15K-J-1/4
R058	ERDS2TJ563	RES,C 56K-J-1/4
R059	ERD25TLJ223	RES,C 22K-J-1/4
R060	ERD25TLJ223	RES,C 22K-J-1/4
R061	ERDS2TJ562	RES,C 5.6K-J-1/4
R062	ERDS2TJ220	RES,C 22-J-1/4
R063	ERDS2TJ392	RES,C 3.9K-J-1/4
R064	ERD25TLJ821	RES,C 820-J-1/4
R065	ERD25TJ101	RES,C 100-J-1/4
R066	ERDS2TJ103	RES,C 10K-J-1/4
R067	ERDS2TJ392	RES,C 3.9K-J-1/4
R068	ERD25TLJ392	RES,C 3.9K-J-1/4
R069	ERD25TLJ392	RES,C 3.9K-J-1/4
R072	ERD25TLJ103	RES,C 10K-J-1/4
R074	ERD25TLJ104	RES,C 100K-J-1/4
R075	ERD25TLJ104	RES,C 100K-J-1/4
R076	ERDS2TJ472	RES,C 4.7K-J-1/4
R077	ERD25TLJ824	RES,C 820K-J-1/4
R078	ERD25TLJ155	RES,C 1.5MEG-J-1/4
R079	ERD25TLJ223	RES,C 22K-J-1/4
R080	ERD25TLJ102	RES,C 1K-J-1/4
R081	ERD25TLJ152	RES,C 1.5K-J-1/4
R082	ERD25TLJ682	RES,C 6.8K-J-1/4
R101	EVN64AA00B24	CONTROL 20K
R102	ERD25TLJ153	RES,C 15K-J-1/4
R103	ERD25TLJ183	RES,C 18K-J-1/4
R104	ERD25TLJ821	RES,C 820-J-1/4
R105	ERD25TLJ331	RES,C 330-J-1/4
R107	ERD25TLJ392	RES,C 3.9K-J-1/4
R108	ERD25TLJ222	RES,C 2.2K-J-1/4
R109	ERD25TLJ472	RES,C 4.7K-J-1/4
R110	ERD25TLJ221	RES,C 220-J-1/4
R112	ERD25TLJ183	RES,C 18K-J-1/4
R113	ERD25TLJ470	RES,C 47-J-1/4
R114	ERD25TLJ104	RES,C 100K-J-1/4
R115	ERD25TLJ561	RES,C 560-J-1/4
R117	ERDS2TJ471	RES,C 470-J-1/4
R152	ERD25TLJ393	RES,C 39K-J-1/4
R153	ERD25TLJ913	RES,C 91K-J-1/4
R181	ERD25TLJ182	RES,C 1.8K-J-1/4
R182	ERDS2TJ182	RES,C 1.8K-J-1/4
R184	ERD25TLJ221	RES,C 220-J-1/4
R185	ERD25TLJ332	RES,C 3.3K-J-1/4
R201	ERD25TLJ153	RES,C 15K-J-1/4
R203	ERD25TLJ101	RES,C 100-J-1/4
R213	ERD25TLJ331	RES,C 330-J-1/4
R230	ERDS1FJ100	RES,C 10-J-1/2
R233	EVUF2AM25B14	CONTROL 10K
R235	EVUF2AM25B54	CONTROL 50K
R237	EVUF2AM25B54	CONTROL 50K
R300	ERD25TLJ473	RES,C 47K-J-1/4
R302	ERD25TLJ564	RES,C 560K-J-1/4
R304	ER0S2CKF5362	RES,M 53.6K-F-2W
R307	EVUF2AM25B14	CONTROL 10K
R308	ERDS2TJ151	RES,C 150-J-1/4
R309	EVND4AA00B13	CONTROL 1K
R311	ERDS2TJ333	RES,C 33K-J-1/4
R312	EVUF3AM2554S	CONTROL 50K
R315	ERD25TLJ334	RES,C 330K-J-1/4
R316	EVN64AA00B24	CONTROL 20K
R318	ERD25TJ104	RES,C 100K-J-1/4
R319	ERD25TJ513	RES,C 51K-J-1/4
R320	EVUF2AM25B54	CONTROL 50K
R321	ERD25TLJ103	RES,C 10K-J-1/4
R322	ERDS2TJ822	RES,C 8.2K-J-1/4
R323	ERD25TLJ184	RES,C 180K-J-1/4
R324	ERD25TLJ102	RES,C 1K-J-1/4
R326	ERD25TLJ103	RES,C 10K-J-1/4
R327	ERD25TJ183	RES,C 18K-J-1/4
R329	ERD25TLJ103	RES,C 10K-J-1/4
R330	ERDS2TJ561	RES,C 560-J-1/4
R333	ERDS2TJ683	RES,C 68K-J-1/4
R336	ERD25TLJ222	RES,C 2.2K-J-1/4
R337	ERDS2TJ223	RES,C 22K-J-1/4
R338	ERD25TLJ473	RES,C 47K-J-1/4
R339	ERDS2TJ123	RES,C 12K-J-1/4
R340	ERD25TLJ103	RES,C 10K-J-1/4
R341	ERD25TLJ472	RES,C 4.7K-J-1/4
R345	ERD25TJ101	RES,C 100-J-1/4
R348	ERDS2TJ152	RES,C 1.5K-J-1/4
R349	ERDS2TJ151	RES,C 150-J-1/4
R350	ERDS2TJ472	RES,C 4.7K-J-1/4
R351	ERDS1TJ272	RES,C 2.7K-J-1/2
R352	ERG2SJS123	RES,M 12K-J-2W
R353	ERDS2TJ122	RES,C 1.2K-J-1/4
R354	EVN89AA00B53	CONTROL 5K
R355	ERD25TLJ563	RES,C 56K-J-1/4
R356	EVN89AA00B32	CONTROL 300 OHM
R357	ERD25TLJ181	RES,C 180-J-1/4
R358	ERDS1TJ272	RES,C 2.7K-J-1/2
R359	ERG2SJS123	RES,M 12K-J-2W
R360	ERDS2TJ122	RES,C 1.2K-J-1/4
R361	EVN89AA00B53	CONTROL 5K
R362	ERD25TLJ473	RES,C 47K-J-1/4
R364	ERDS2TJ271	RES,C 270-J-1/4
R365	ERDS1TJ272	RES,C 2.7K-J-1/2
R366	ERG2SJS123	RES,M 12K-J-2W
R367	ERD25TLJ122	RES,C 1.2K-J-1/4
R368	EVN89AA00B53	CONTROL 5K

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Ref. No.	Part No.	Description
R370	EVN89AA00B32	CONTROL 300 OHM
R371	ERD25TLJ221	RES,C 220-J-1/4
R374	ERD25TLJ184	RES,C 180K-J-1/4
R375	ERD25TLJ153	RES,C 15K-J-1/4
R376	ERD25TLJ563	RES,C 56K-J-1/4
R378	**ERQ1CJP1R7**	**RES,F 1.7-J-1W**
R380	ERDS2TJ101	RES,C 100-J-1/4
R381	ERD25TLJ470	RES,C 47-J-1/4
R390	ERD25TLJ561	RES,C 560-J-1/4
R392	ERD25TJ331	RES,C 330-J-1/4
R393	ERD25TLJ102	RES,C 1K-J-1/4
R394	ERD25TLJ102	RES,C 1K-J-1/4
R395	ERD25TLJ331	RES,C 330-J-1/4
R396	ERDS2TJ472	RES,C 4.7K-J-1/4
R397	ERD25TLJ331	RES,C 330-J-1/4
R401	ERDS2TJ474	RES,C 470K-J-1/4
R402	ERD25TLJ272	RES,C 2.7K-J-1/4
R403	ERDS2TJ101	RES,C 100-J-1/4
R404	ERD25TLJ100	RES,C 10-J-1/4
R405	EVN64AA00B22	CONTROL 200 OHM
R406	ERD25TLJ3R9	RES,C 3.9-J-1/4
R407	ERD25TLJ271	RES,C 270-J-1/4
R408	ERD25TLJ332	RES,C 3.3K-J-1/4
R409	ERD25TLJ113	RES,C 11K-J-1/4
R412	ERD25TLJ563	RES,C 56K-J-1/4
R420	ERD25TLJ561	RES,C 560-J-1/4
R452	ERDS1FJ4R7	RES,C 4.7-J-1/2
R453	ERDS1FJ681	RES,C 680-J-1/2
R455	ERDS2TJ562	RES,C 5.6K-J-1/4
R456	ERDS1TJ1R8	RES,C 1.8-J-1/2
R457	ERD25FJ392	RES,C 3.9K-J-1/4
R459	ERD25TLJ223	RES,C 22K-J-1/4
R461	ERD25TLJ562	RES,C 5.6K-J-1/4
R462	ERD25TJ223	RES,C 22K-J-1/4
R501	ERDS2TJ562	RES,C 5.6K-J-1/4
R502	ERD25TLJ822	RES,C 8.2K-J-1/4
R503	ERD25TLJ391	RES,C 390-J-1/4
R504	ERD25TLJ105	RES,C 1MEG-J-1/4
R507	ERG2ANJ392	RES,M 3.9K-J-2W
R508	ERD25TLJ272	RES,C 2.7K-J-1/4
R509	ERD25TLJ561	RES,C 560-J-1/4
R510	**ERG5SJ152**	**RES,M 1.5K-J-5W**
R511	ERD25TLJ181	RES,C 180-J-1/4
R512	ERD25TLJ472	RES,C 4.7K-J-1/4
R513	ERDS2TJ101	RES,C 100-J-1/4
R517	ERDS2TJ105	RES,C 1MEG-J-1/4
R524	EVND4AA00B22	CONTROL 200 OHM
R531	**ERD25FJ470**	**RES,C 47-J-1/4**
R532	**ER0S2CKF2432**	**RES,M 24.3K-F-2W**
R533	**ER025CKF8661**	**RES,M 8.66K-F-1/4**
R534	**ERDS2TJ561**	**RES,C 560-J-1/4**
R535	ERD25TJ821	RES,C 820-J-1/4
R536	**ERD25TLJ563**	**RES,C 56K-J-1/4**
R537	ERD25TJ822	RES,C 8.2K-J-1/4
R538	**ERDS1TJ684**	**RES,C 680K-J-1/2**
R540	ERD25TLJ683	RES,C 68K-J-1/4
R541	**ERD25TLJ104**	**RES,C 100K-J-1/4**
R551	ERG2ANJ101	RES,M 100-J-2W
R552	**ERG1SJ470**	**RES,M 47-J-1W**
R553	**ERG1SJ101**	**RES,M 100-J-1W**
R554	**ERQ2CJP821**	**RES,F 820-J-2W**
R555	ERD25TLJ103	RES,C 10K-J-1/4
R556	ERD25TLJ104	RES,C 100K-J-1/4
R557	ERD25TLJ333	RES,C 33K-J-1/4
R559	ERD25TLJ153	RES,C 15K-J-1/4
R560	ERDS2TJ272	RES,C 2.7K-J-1/4
R561	ERDS2TJ472	RES,C 4.7K-J-1/4
R562	**ERD25TLJ471**	**RES,C 470-J-1/4**
R569	ERD25TLJ392	RES,C 3.9K-J-1/4
R574	**ERQ1CJP1R0**	**RES,F 1.0-J-1W**
R575	**ERQ12HJ1R8**	**RES,F 1.8-J-1/2**
R576	ERDS2TJ222	RES,C 2.2K-J-1/4
R577	ERDS2TJ431	RES,C 430-J-1/4
R578	ERD25TLJ682	RES,C 6.8K-J-1/4
R601	ERD25TLJ224	RES,C 220K-J-1/4
R602	ERDS2TJ242	RES,C 2.4K-J-1/4
R603	EVUF2AM25B14	CONTROL 10K
R604	ERDS2TJ153	RES,C 15K-J-1/4
R605	ERD25TLJ103	RES,C 10K-J-1/4
R606	ERDS2TJ103	RES,C 10K-J-1/4
R607	ERD25TLJ392	RES,C 3.9K-J-1/4

Ref. No.	Part No.	Description
R608	ERD25TLJ561	RES,C 560-J-1/4
R609	ERDS2TJ822	RES,C 8.2K-J-1/4
R610	EVUF2AM25B14	CONTROL 10K
R611	ERD25TJ203	RES,C 20K-J-1/4
R612	EVND4AA00B14	CONTROL 10K
R614	ERDS2TJ154	RES,C 150K-J-1/4
R615	ERDS2TJ113	RES,C 11K-J-1/4
R616	ERDS2TJ242	RES,C 2.4K-J-1/4
R618	ERDS2TJ271	RES,C 270-J-1/4
R619	ERD25TLJ271	RES,C 270-J-1/4
R620	ERDS2TJ271	RES,C 270-J-1/4
R622	ERD25TLJ153	RES,C 15K-J-1/4
R624	ERDS2TJ332	RES,C 3.3K-J-1/4
R625	ERDS2TJ682	RES,C 6.8K-J-1/4
R629	ERD25TLJ471	RES,C 470-J-1/4
R751	ERDS1FJ271	RES,C 270-J-1/2
R752	ERD25TJ122	RES,C 1.2K-J-1/4
R753	ERD25TJ123	RES,C 12K-J-1/4
R754	ERD25TJ822	RES,C 8.2K-J-1/4
R755	ERD25TJ274	RES,C 270K-J-1/4
R756	ERD25TJ103	RES,C 10K-J-1/4
R757	ERD25TJ224	RES,C 220K-J-1/4
R758	ERD25TJ243	RES,C 24K-J-1/4
R759	ERD25TJ102	RES,C 1K-J-1/4
R760	EVN64AA00B53	CONTROL 5K
R761	EVN64AA00B14	CONTROL 10K
R762	ERD25TJ222	RES,C 2.2K-J-1/4
R763	ERD25TJ124	RES,C 120K-J-1/4
R764	ERD25TJ183	RES,C 18K-J-1/4
R765	ERD25TJ392	RES,C 3.9K-J-1/4
R766	ERD25TJ272	RES,C 2.7K-J-1/4
R767	ERD25TJ222	RES,C 2.2K-J-1/4
R768	ERQ2CJP100	RES,F 10-J-2W
R769	ERG3ANJ562	RES,M 5.6K-J-3W
R771	ERG5ZJ681	RES,M 680-J-5W
R784	ERG2SJS273	RES,M 27K-J-2W
R801	**ERF5ZKR82**	**RES,W .82-K-5W**
R802	**ERDS1TJ154**	**RES,C 150K-J-1/2**
R803	**ERF5ZJ471**	**RES,W 470-J-5W**
R804	**ERF20ZJ121**	**RES,W 120-J-20W**
R805	**ERDS1TJ103**	**RES,C 10K-J-1/2**
R807	**ERD25FJ470**	**RES,C 47-J-1/4**
R808	**ERD25FJ330**	**RES,C 33-J-1/4**
R809	**ERD25TLJ224**	**RES,C 220K-J-1/4**
R810	**ERF5ZK4R7**	**RES,W 4.7-K-5W**
R815	**ERC12ZGK275**	**RES,S 2.7MEG-K-1/2**
R825	ERG5SJ121	RES,M 120-J-5W
R826	**ERW12PK1R0**	**RES,W 1.0-K-1/2**
R901	ERDS2TJ182	RES,C 1.8K-J-1/4
R902	ERDS2TJ222	RES,C 2.2K-J-1/4
R903	ERDS2TJ123	RES,C 12K-J-1/4
R904	ERDS2TJ562	RES,C 5.6K-J-1/4
R905	ERDS2TJ271	RES,C 270-J-1/4
R906	ERDS2TJ102	RES,C 1K-J-1/4
R908	ERDS2TJ272	RES,C 2.7K-J-1/4
R909	ERDS2TJ272	RES,C 2.7K-J-1/4
R910	ERG1SJ151	RES,M 150-J-1W
R911	ERD25FJ181	RES,C 180-J-1/4
R913	ERDS2TJ1R5	RES,C 1.5-J-1/4
R951	ERDS2TJ122	RES,C 1.2K-J-1/4
R952	ERDS2TJ223	RES,C 22K-J-1/4
R953	ERDS2TJ272	RES,C 2.7K-J-1/4
R954	ERDS2TJ182	RES,C 1.8K-J-1/4
R955	ERDS2TJ330	RES,C 33-J-1/4
R956	ERDS2TJ221	RES,C 220-J-1/4
R960	ERD25FJ100	RES,C 10-J-1/4
R961	ERG2ANJ272	RES,M 2.7K-J-2W
R962	ERD25FJ820	RES,C 82-J-1/4
R963	ERD25FJ820	RES,C 82-J-1/4
R964	ERDS2TJ122	RES,C 1.2K-J-1/4
R965	ERDS2TJ563	RES,C 56K-J-1/4
R966	ERD50FJ471	RES,C 470-J-1/2
R967	ERDS2TJ563	RES,C 56K-J-1/4
R968	ERDS2TJ122	RES,C 1.2K-J-1/4
R969	ERD25FJ390	RES,C 39-J-1/4
R970	ERD25TJ2R7	RES,C 2.7-J-1/4
R971	ERD25TJ2R7	RES,C 2.7-J-1/4
R972	ERD25FJ390	RES,C 39-J-1/4
R973	ERD50FJ121	RES,C 120-J-1/2
R975	ERG2ANJ272	RES,M 2.7K-J-2W
R1262	ERDS2TJ103	RES,C 10K-J-1/4

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REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
R2101	ERD25FJ180	RES,C 18-J-1/4
R2110	ERDS2TJ221	RES,C 220-J-1/4
R2111	ERDS2TJ221	RES,C 220-J-1/4
R2119	ERDS2TJ562	RES,C 5.6K-J-1/4
R2120	ERDS2TJ562	RES,C 5.6K-J-1/4
R2121	ERD25FJ330	RES,C 33-J-1/4
R2124	ERDS2TJ102	RES,C 1K-J-1/4
R2149	ERDS2TJ102	RES,C 1K-J-1/4
R2150	ERDS2TJ823	RES,C 82K-J-1/4
R2151	ERDS2TJ102	RES,C 1K-J-1/4
R2152	ERDS2TJ102	RES,C 1K-J-1/4
R2156	ERDS2TJ562	RES,C 5.6K-J-1/4
R2158	ERDS2TJ102	RES,C 1K-J-1/4
R2160	ERDS2TJ101	RES,C 100-J-1/4
R2162	ERDS2TJ562	RES,C 5.6K-J-1/4
R2200	EVND1AA00B14	CONTROL 10K
R2201	ERDS2TJ103	RES,C 10K-J-1/4
R2202	EVND4AA00B54	CONTROL 50K
R2203	ER025CKF8202	RES,M 82K-F-1/4
R2204	ER025CKF8202	RES,M 82K-F-1/4
R2205	EVND4AA00B15	CONTROL 100K
R2206	ERDS2TJ104	RES,C 100K-J-1/4
R2207	ERDS2TJ472	RES,C 4.7K-J-1/4
R2209	ERDS2TJ102	RES,C 1K-J-1/4
R2213	ERDS2TJ333	RES,C 33K-J-1/4
R2214	ERDS2TJ223	RES,C 22K-J-1/4
R2215	ERDS2TJ153	RES,C 15K-J-1/4
R2216	ERDS2TJ153	RES,C 15K-J-1/4
R2217	ERDS2TJ223	RES,C 22K-J-1/4
R2218	ERDS2TJ103	RES,C 10K-J-1/4
R2219	ERDS2TJ223	RES,C 22K-J-1/4
R2220	ERDS2TJ102	RES,C 1K-J-1/4
R2221	ERQ12AJ220	RES,F 22-J-1/2
R2222	EVND4AA00B14	CONTROL 10K
R2223	ERDS2TJ561	RES,C 560-J-1/4
R2224	ERDS2TJ103	RES,C 10K-J-1/4
R2225	EVND4AA00B14	CONTROL 10K
R2226	EVND4AA00B55	CONTROL 500K
R2227	ERDS2TJ473	RES,C 47K-J-1/4
R2228	ERDS2TJ242	RES,C 2.4K-J-1/4
R2229	EVND4AA00B14	CONTROL 10K
R2230	EVND4AA00B14	CONTROL 10K
R2231	ERDS2TJ102	RES,C 1K-J-1/4
R2232	ERDS2TJ102	RES,C 1K-J-1/4
R2233	ERDS2TJ103	RES,C 10K-J-1/4
R2234	ERDS2TJ682	RES,C 6.8K-J-1/4
R2235	ERDS2TJ333	RES,C 33K-J-1/4
R2236	EVND4AA00B54	CONTROL 50K
R2237	ERDS2TJ333	RES,C 33K-J-1/4
R2238	ERDS2TJ122	RES,C 1.2K-J-1/4
R2239	ERDS2TJ361	RES,C 360-J-1/4
R2240	ERDS2TJ301	RES,C 300-J-1/4
R2241	ERDS2TJ752	RES,C 7.5K-J-1/4
R2242	EVND4AA00B53	CONTROL 5K
R2243	ER025CKF5603	RES,M 560K-F-1/4
R2244	ERDS2TJ222	RES,C 2.2K-J-1/4
R2245	ER025CKF2202	RES,M 22K-F-1/4
R2246	ERDS2TJ392	RES,C 3.9K-J-1/4
R2247	ERDS2TJ103	RES,C 10K-J-1/4
R2248	ERDS2TJ102	RES,C 1K-J-1/4
R2250	ERDS2TJ101	RES,C 100-J-1/4
R2251	ERDS2TJ104	RES,C 100K-J-1/4
R2252	ERDS2TJ103	RES,C 10K-J-1/4
R2258	ERDS2TJ681	RES,C 680-J-1/4
R2259	ERDS2TJ122	RES,C 1.2K-J-1/4
R2268	ERDS2TJ103	RES,C 10K-J-1/4
R2269	ERDS2TJ563	RES,C 56K-J-1/4
R2274	ERDS2TJ821	RES,C 820-J-1/4
R2275	ERDS2TJ122	RES,C 1.2K-J-1/4
R2276	ERDS2TJ122	RES,C 1.2K-J-1/4
R2277	ERDS2TJ821	RES,C 820-J-1/4
R2278	ERDS2TJ682	RES,C 6.8K-J-1/4
R2301	ERDS2TJ122	RES,C 1.2K-J-1/4
R2302	ERDS2TJ152	RES,C 1.5K-J-1/4
R2303	ERDS2TJ122	RES,C 1.2K-J-1/4
R2304	ERDS2TJ152	RES,C 1.5K-J-1/4
R2305	ERDS2TJ102	RES,C 1K-J-1/4
R2306	ERD25FJ4R7	RES,C 4.7-J-1/4
R2307	ERDS2TJ123	RES,C 12K-J-1/4
R2308	ERDS2TJ123	RES,C 12K-J-1/4
R2309	ERD25FJ4R7	RES,C 4.7-J-1/4
R2310	ERDS2TJ102	RES,C 1K-J-1/4
R2311	ERDS2TJ101	RES,C 100-J-1/4
R2312	ERDS2TJ101	RES,C 100-J-1/4
R2402	ERDS2TJ182	RES,C 1.8K-J-1/4
R2403	**ERQ12HKR68**	**RES,F .68-K-1/2**
R3001	ERDS2TJ182	RES,C 1.8K-J-1/4
R3002	ERDS2TJ102	RES,C 1K-J-1/4
R3003	EVND1AA00B53	CONTROL 5K
R3004	ERDS2TJ223	RES,C 22K-J-1/4
R3005	ERDS2TJ103	RES,C 10K-J-1/4
R3007	ERDS2TJ562	RES,C 5.6K-J-1/4
R3018	ERDS2TJ222	RES,C 2.2K-J-1/4
R3019	ERDS2TJ222	RES,C 2.2K-J-1/4
R3020	ERDS2TJ334	RES,C 330K-J-1/4
R3021	ERDS2TJ184	RES,C 180K-J-1/4
R3023	ERDS2TJ334	RES,C 330K-J-1/4
R3024	ERDS2TJ184	RES,C 180K-J-1/4
R3032	ERDS2TJ272	RES,C 2.7K-J-1/4
R3033	ERDS2TJ104	RES,C 100K-J-1/4
R3034	ERDS2TJ272	RES,C 2.7K-J-1/4
R3035	ERDS2TJ104	RES,C 100K-J-1/4
R3040	ERDS2TJ390	RES,C 39-J-1/4
R3044	ERDS2TJ822	RES,C 8.2K-J-1/4
R3046	ERDS2TJ101	RES,C 100-J-1/4
R3052	ERDS2TJ221	RES,C 220-J-1/4
R3053	ERDS2TJ221	RES,C 220-J-1/4
R3056	ERDS2TJ221	RES,C 220-J-1/4
R3084	ERDS2TJ222	RES,C 2.2K-J-1/4
R3090	ERDS2TJ222	RES,C 2.2K-J-1/4
R3101	ERDS2TJ332	RES,C 3.3K-J-1/4
R3104	ERDS2TJ821	RES,C 820-J-1/4
R3105	ERDS2TJ222	RES,C 2.2K-J-1/4
R3106	ERDS2TJ332	RES,C 3.3K-J-1/4
R3109	ERDS2TJ821	RES,C 820-J-1/4
R3110	ERDS2TJ222	RES,C 2.2K-J-1/4
R3111	ERDS2TJ473	RES,C 47K-J-1/4
R3112	ERDS2TJ473	RES,C 47K-J-1/4
R3113	ERDS2TJ102	RES,C 1K-J-1/4
R3114	ERDS2TJ102	RES,C 1K-J-1/4
R3120	ERDS2TJ221	RES,C 220-J-1/4
R3122	ERDS2TJ222	RES,C 2.2K-J-1/4
R3123	ERDS2TJ222	RES,C 2.2K-J-1/4
R3125	ERDS2TJ222	RES,C 2.2K-J-1/4
R3126	ERDS2TJ222	RES,C 2.2K-J-1/4
R3203	ERDS2TJ101	RES,C 100-J-1/4
R3204	ERDS2TJ223	RES,C 22K-J-1/4
R3205	ERDS2TJ822	RES,C 8.2K-J-1/4
R3206	ERDS2TJ562	RES,C 5.6K-J-1/4
R3208	ERDS2TJ103	RES,C 10K-J-1/4
R3209	ERDS2TJ822	RES,C 8.2K-J-1/4
R3210	ERDS2TJ222	RES,C 2.2K-J-1/4
R3211	ERDS2TJ101	RES,C 100-J-1/4
R3212	ERDS2TJ471	RES,C 470-J-1/4
R3213	ERDS2TJ223	RES,C 22K-J-1/4
R3214	ERDS2TJ822	RES,C 8.2K-J-1/4
R3217	ERDS2TJ562	RES,C 5.6K-J-1/4
R3218	ERDS2TJ152	RES,C 1.5K-J-1/4
R3219	ERDS2TJ273	RES,C 27K-J-1/4
R3220	ERDS2TJ101	RES,C 100-J-1/4
R3221	ERDS2TJ223	RES,C 22K-J-1/4
R3222	ERDS2TJ152	RES,C 1.5K-J-1/4
R3223	ERDS2TJ222	RES,C 2.2K-J-1/4
R3224	ERDS2TJ223	RES,C 22K-J-1/4
R3225	ERDS2TJ222	RES,C 2.2K-J-1/4
R3226	ERDS2TJ223	RES,C 22K-J-1/4
R3227	ERDS2TJ101	RES,C 100-J-1/4
R3232	ERDS2TJ101	RES,C 100-J-1/4
R3233	ERDS2TJ821	RES,C 820-J-1/4
R3234	ERDS2TJ331	RES,C 330-J-1/4
R3235	ERDS2TJ103	RES,C 10K-J-1/4
R3236	ERDS2TJ103	RES,C 10K-J-1/4
R3237	ERDS2TJ153	RES,C 15K-J-1/4
R3238	ERDS2TJ101	RES,C 100-J-1/4
R3239	ERDS2TJ182	RES,C 1.8K-J-1/4
R3240	ERDS2TJ182	RES,C 1.8K-J-1/4
R3243	ERDS2TJ123	RES,C 12K-J-1/4
R3244	ERDS2TJ393	RES,C 39K-J-1/4
R3245	ERDS2TJ102	RES,C 1K-J-1/4
R3246	ERDS2TJ101	RES,C 100-J-1/4
R3247	ERDS2TJ151	RES,C 150-J-1/4
R3248	ERDS2TJ682	RES,C 6.8K-J-1/4

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REPLACEMENT PARTS LIST

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Ref. No.	Part No.	Description
R3249	ERDS2TJ392	RES,C 3.9K-J-1/4
R3250	ERDS2TJ103	RES,C 10K-J-1/4
R3251	ERDS2TJ103	RES,C 10K-J-1/4
R3252	EVND1AA00B52	CONTROL 500 OHM
R3253	ERDS2TJ331	RES,C 330-J-1/4
R3254	ERDS2TJ331	RES,C 330-J-1/4
R3255	ERDS2TJ102	RES,C 1K-J-1/4
R3256	ERDS2TJ471	RES,C 470-J-1/4
R3257	ERDS2TJ151	RES,C 150-J-1/4
R3258	ERDS2TJ222	RES,C 2.2K-J-1/4
R3259	ERDS2TJ152	RES,C 1.5K-J-1/4
R3260	ERDS2TJ471	RES,C 470-J-1/4
R3261	ERDS2TJ152	RES,C 1.5K-J-1/4
R3262	ERDS2TJ222	RES,C 2.2K-J-1/4
R3263	ERDS2TJ102	RES,C 1K-J-1/4
R3264	ERDS2TJ391	RES,C 390-J-1/4
R3265	ERDS2TJ271	RES,C 270-J-1/4
R3266	ERDS2TJ102	RES,C 1K-J-1/4
R3267	ERDS2TJ102	RES,C 1K-J-1/4
R3268	ERDS2TJ682	RES,C 6.8K-J-1/4
R3270	ERDS2TJ153	RES,C 15K-J-1/4
R3271	ERDS2TJ473	RES,C 47K-J-1/4
R3272	ERDS2TJ472	RES,C 4.7K-J-1/4
R3273	ERDS2TJ271	RES,C 270-J-1/4
R3274	ERD25FJ470	RES,C 47-J-1/4
R3275	ERDS2TJ102	RES,C 1K-J-1/4
R3276	ERDS2TJ182	RES,C 1.8K-J-1/4
SWITCHES		
SW010	EVQQS605T	SWITCH
SW011	EVQQS605T	SWITCH
SW012	EVQQS605T	SWITCH
SW013	EVQQS605T	SWITCH
SW014	EVQQVC13T	SWITCH
SW015	EVQQVC13T	SWITCH
SW016	EVQQVC13T	SWITCH
SW017	EVQQS605T	SWITCH
SW018	EVQQVC13T	SWITCH
SW019	EVQQS605T	SWITCH
SW020	EVQQS605T	SWITCH
SW021	ESD32216	SWITCH
SW022	EVQQVC13T	SWITCH
SW023	ESB64613	SWITCH
SW301	EVQR7AL13	SWITCH, SERVICE
SW601	ESB64613	SWITCH
SW1201	ESB64613	SWITCH
SW2301	ESD14536	SWITCH
SW3201	ESB64613	SWITCH
SW3202	ESB64613	SWITCH
TRANSFORMERS		
T201	TLS62366-1	AUDIO IF TRANS.
T501	**TLH15452**	**HORIZONTAL DRIVER**
T502	**ETE19Z30AY**	**TRANSFORMER, HORIZONTAL COUPLING**
T551	**TLF15525B**	**TRANSFORMER, FLYBACK**
T751	**ETE16Z37AY**	**TRANSFORMER, PINCUSHION**
T801	**TLP16297**	**TRANSFORMER, POWER SUPPLY**
T2401	**ETP48EU28B**	**TRANSFORMER, AUDIO POWER**
CRYSTALS/FILTERS		
X010	EYXTE405S13	CRYSTAL, SYNTHESIZER CLOCK
X101	EFCH45MVK11T	SAW FILTER
X102	EFCS4R5MW3BA	4.5MHZ TRAP
X201	EFCS4R5MS4W	FILTER 4.5MHZ BANDPASS
X501	TAFCSB503F33	CRYSTAL, HORIZONTAL OSCILLATOR
X601	TSS816M	CRYSTAL 3.58MHZ OSCILLATOR
OTHERS		
------	EAS15S02H	SPEAKER, 8 OHM
------	EAS4FP10P	SPEAKER, 140 OHM
------	**ENV56826G3**	**U/V TUNER**
------	ETC35X7F	YOKE, CONVERGENCE
------	EUR50EC538B	BATTERY COVER: TRANSMITTER
------	EUR50VCS586	BOTTOM CASE: TRANSMITTER
------	EUR50VCS599	UPPER CASE: TRANSMITTER
------	EUR50441	TRANSMITTER, REMOTE CONTROL

Ref. No.	Part No.	Description
------	**M68JUA21X**	**CRT, 27"**
------	TBM120646	OVERLAY, CONTROL PANEL
------	TBM173029-2	BADGE, PANASONIC
------	TBX2583500	ASSY. 6 PUSHBUTTON: AUDIO MODE/CHNL/ TV/VIDEO/VOL
------	TBX2583600	PUSHBUTTON: POWER
------	TEK13321	DAMPER, DOOR CONTROL
------	TEK17918	DOOR, CATCH
------	TES2A20310	SPRING, DAG GROUND
------	TES2248	SPRING, POWER PUSHBUTTON
------	TJB1723600	CONVERTER, 75-300 OHM
------	TJB1723800	2RF ANTENNA TERMINAL BOARD: COMPLETE
------	TJC6319	FUSE HOLDER: F001
------	TJC6320	FUSE HOLDER: F002
------	TJS1A5050	CRT SOCKET
------	TKK158366	OVERLAY, LED
------	TKK179668	OVERLAY, BACK COVER: 25MM
------	TKK179669-1	OVERLAY, BACK COVER: 192MM
------	TKK179670	OVERLAY, BACK COVER: 44.5MM
------	TKK69285-8	HANDLE, CABINET BACK: (2 USED)
------	TKP1511046	PANEL, ACRYLIC: LED
------	TKP1511052-4	ASSY. CONTROL DOOR
------	TKP1511072	STRAIN RELIEF: AC CORD
------	TKR27700	TRIM, DECORATIVE
------	TKU522602	PANEL, SPEAKER MTG. BACK
------	TKZ159931	TRIM, DECORATIVE: CHROME (2 USED)
------	TMM15428	CLAMPER, DEGAUSSING COIL
------	TMM15544	WASHER, RUBBER CRT MTG.
------	TMM27504	PAD RUBBER, YOKE
------	TMZ159932	HOLDER, DAMPER
------	TMZ159933	ARM, DAMPER
------	TPC2A30141	PKG. REGULAR SLTD CARTON
------	TQB2A0304	MANUAL, OWNERS'
------	**TSX5130**	**AC LINE CORD**
------	TXFKU237SER	ASSY. CABINET BACK
------	TXFKY097SER	ASSY. SPEAKER PANEL: FRONT; RIGHT SIDE
------	TXFKY107SER	ASSY. SPEAKER PANEL: FRONT; LEFT SIDE
------	TXFKY217SER	ASSY. CABINET FRONT
------	TXF3A02UARM	ASSY. DAG GROUND
------	0FMK014ZZ	CONVERGENCE CORRECTOR STRIP

ABBREVIATION OF PART NAME AND DESCRIPTION

RESISTOR

PART NAME & DESCRIPTION			
TYPE		ALLOWANCE	
C	Carbon	F	± 1%
F	Fuse	J	± 5%
M	Metal Oxide	K	± 10%
S	Solid	M	± 20%
W	Wire Wound	G	± 2%

Part No.		Description		
Example: ERD25TJ104	©	100kΩ	(J)	1/4W

CAPACITOR

PART NAME & DESCRIPTION			
TYPE		ALLOWANCE	
C	Ceramic	C	± 0.25pF
E	Electrolytic	D	± 0.5pF
P	Polyester	F	± 1pF
S	Styrol	J	± 5%
T	Tantalum	K	± 10%
		L	± 15%
		M	± 20%
		P	+100% −0%
		Z	+80% −20%

Part No.		Description		
Example: ECKF1H103ZF	©	0.01μF	(Z)	50V

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